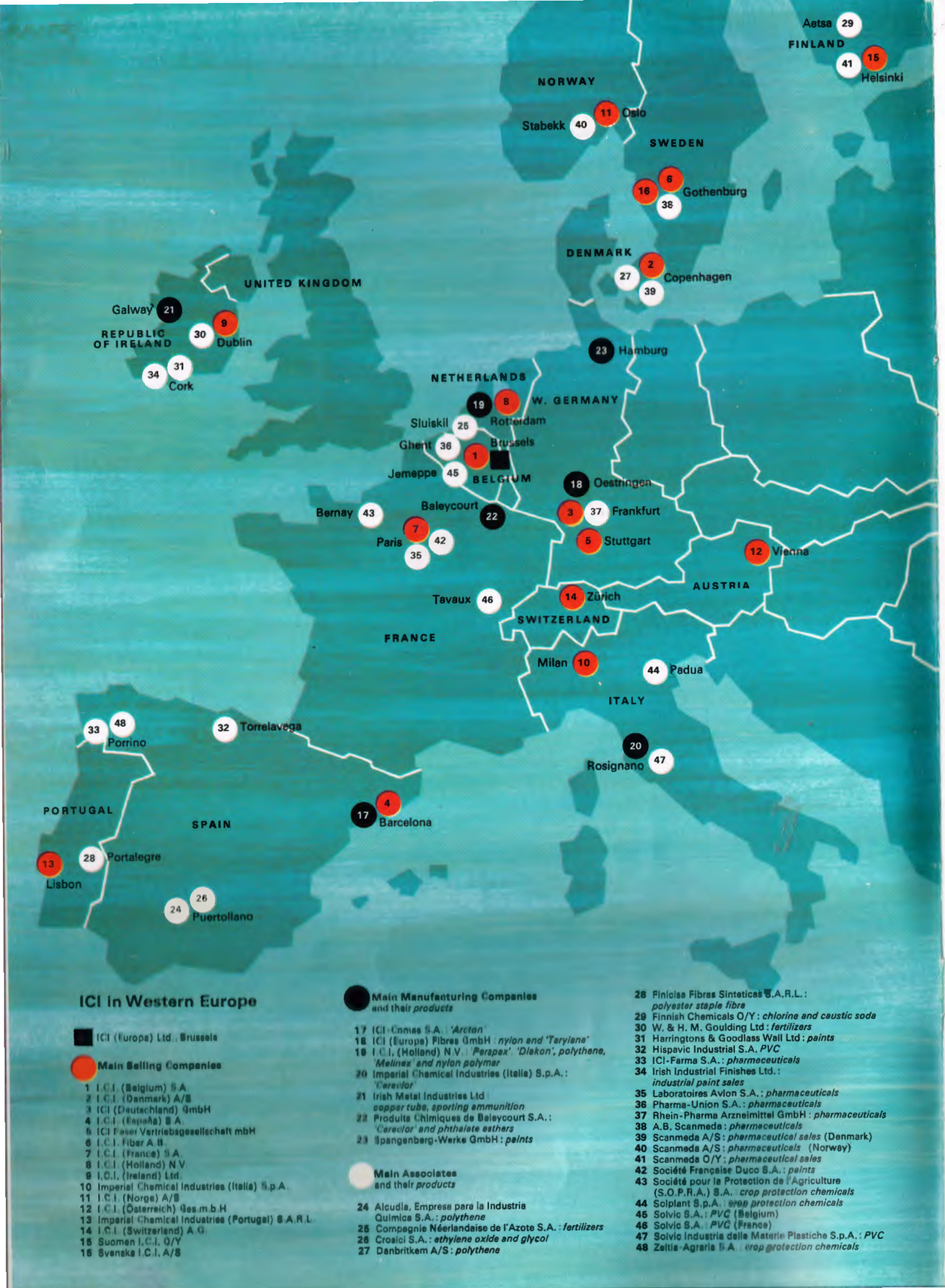
ICI magazine

April/May 1967



ICI in Western Europe

ICI (Europe) Ltd., Brussels

Main Selling Companies

1 I.C.I. (Belgium) S.A.
2 I.C.I. (Danmark) A/S
3 ICI (Deutschland) GmbH
4 I.C.I. (España) S.A.
5 ICI Faser Vertriebsgesellschaft mbH
6 I.C.I. Fiber A.B.
7 I.C.I. (France) S.A.
8 I.C.I. (Holland) N.V.
9 I.C.I. (Ireland) Ltd.
10 Imperial Chemical Industries (Italia) S.p.A.
11 I.C.I. (Norge) A/S
12 I.C.I. (Österreich) Ges.m.b.H.
13 Imperial Chemical Industries (Portugal) S.A.R.L.
14 I.C.I. (Switzerland) A.G.
15 Suomen I.C.I. O/Y
16 Svenska I.C.I. A/S

Main Manufacturing Companies and their *products*

17 ICI-Cromas S.A.: *'Arcton'*
18 ICI (Europe) Fibres GmbH: *nylon and 'Terylene'*
19 I.C.I. (Holland) N.V.: *'Perspex', 'Diakon', polythene, 'Melinex' and nylon polymer*
20 Imperial Chemical Industries (Italia) S.p.A.: *'Cereclor'*
21 Irish Metal Industries Ltd: *copper tube, sporting ammunition*
22 Produits Chimiques de Baleycourt S.A.: *'Cereclor' and phthalate esthers*
23 Spangenberg-Werke GmbH: *paints*

Main Associates and their *products*

24 Alcudia, Empresa para la Industria Quimica S.A.: *polythene*
25 Compagnie Néerlandaise de l'Azote S.A.: *fertilizers*
26 Crosici S.A.: *ethylene oxide and glycol*
27 Danbritkem A/S: *polythene*
28 Finicisa Fibras Sinteticas S.A.R.L.: *polyester staple fibre*
29 Finnish Chemicals O/Y: *chlorine and caustic soda*
30 W. & H. M. Goulding Ltd: *fertilizers*
31 Harringtons & Goodlass Wall Ltd: *paints*
32 Hispavic Industrial S.A. *PVC*
33 ICI-Farma S.A.: *pharmaceuticals*
34 Irish Industrial Finishes Ltd.: *industrial paint sales*
35 Laboratoires Avlon S.A.: *pharmaceuticals*
36 Pharma-Union S.A.: *pharmaceuticals*
37 Rhein-Pharma Arzneimittel GmbH: *pharmaceuticals*
38 A.B. Scanmeda: *pharmaceuticals*
39 Scanmeda A/S: *pharmaceutical sales* (Denmark)
40 Scanmeda A/S: *pharmaceuticals* (Norway)
41 Scanmeda O/Y: *pharmaceutical sales*
42 Société Française Duco S.A.: *paints*
43 Société pour la Protection de l'Agriculture (S.O.P.R.A.) S.A.: *crop protection chemicals*
44 Solplant S.p.A.: *crop protection chemicals*
45 Solvic S.A.: *PVC* (Belgium)
46 Solvic S.A.: *PVC* (France)
47 Solvic Industria delle Materie Plastiche S.p.A.: *PVC*
48 Zeltia-Agraria S.A.: *crop protection chemicals*

ICI magazine

Volume 45 Number 335

Cover

Group sales to European customers rose by 13 per cent during 1966. Signposted in 'Perspex,' the way into the markets of Europe from ICI (Holland)'s Rozenburg works runs through the heart of Rotterdam

Photograph: John Chillingworth

ICI Magazine is published for employees every other month, price 4d. Articles, photographs and suggestions for articles are invited from members of the Company. Payment is made for those accepted. The Company does not necessarily endorse the views of contributors.

Published by Imperial Chemical Industries Limited
Imperial Chemical House, Millbank, London SW1

Editor Francis Odle
Designers Charbonneau & Dauphinais
Printers The Kynoch Press, Birmingham

In chemicals tomorrow never simply arrives. It has to be manufactured. And one of the places where it is being manufactured is the Rozenburg Works of ICI (Holland), 18 kilometres south-west of Rotterdam, which is already the world's greatest port and rapidly becoming the most dynamic industrial complex in Europe. Telegraphic address: ICIROZ, the title of our picture story, which looks in the following pages at Rozenburg, and some of its people, then relates the whole venture to the policies of ICI (Europa).

Out here on the flat, windswept lands of the Rhine Delta new drives are at work, a new industrial society is in the making. ICIROZ, where the average age is just over 30, reflects the tempo of this new society and its growing momentum in Europe. Ton Van Namen, the Works General Manager, a crisp, urgent-speaking Dutchman of 40, has nursed the whole enterprise from the time when it was only a few little huts on an empty site, back in 1962, to the present spring of 1967, with five plants fully on stream and another three to go up.

'By the end of 1967 there will be 1150 people on operations at Rozenburg, with another 100 or so on engineering and construction. This is just five years after the first piles were driven, in May 1962. Over half the operations people were taken on in the period January–October 1966. I believe firmly in the future of the chemical industry, fibres or polymers alike, and I don't see any reason why we should not double our numbers again in another five years' time.'

Trained as a chemical engineer at the University of Delft, he later spent a short period with the Dutch Navy. 'When I came out and started to think about a job, the only thing I knew was that I did not want to stay in a laboratory – I wanted to work with people. That course at Delft was a long one!' So he went into the Dutch chemical industry, where his experience included setting up a whole plant from scratch, and dealing with materials, construction, labour and staff, a very useful rehearsal on a smaller scale for Rozenburg.

There were two main problems at the beginning. One was the relative absence, compared with the UK, of a heavy industrial tradition. 'We Dutch were a nation of farmers, fishermen and salesmen,' he emphasises. 'Now if you go to the Tees-side sites and talk to an operator, you will find that his father and grandfather perhaps also worked in the chemical industry. There is nothing like that here at all. Even big international companies with headquarters here in Holland, up till the last war anyway, had their main manufacturing sites outside the country.'

The other was that ICI was not generally known in Holland, apart from business and government circles. 'When I joined in 1961 I had just about heard of ICI, but that was all, and this was a big drawback. Together with Crawford Petrie (then Engineering Manager, European Council, now Chief Engineer ICI (Europa)) I had to build up a team of Dutchmen at all levels from scratch. When we started advertising, the first question people who came along asked was, what is ICI?' This problem was tackled with typical Dutch briskness and energy, through forceful and informative full-page advertisements in selected papers. 'More than once during this recruitment campaign we drew over 1,000 replies from a single advertisement.'

The planning and layout of the site at a time when it was not even known what would be made there was another exercise in preparing for tomorrow. 'We didn't have a clue, apart from the first two plants, what type of other plant would be needed. However, we planned to be ready for almost anything in the future. Our site here is one mile long and half a mile deep. Now almost any modern chemical plant can be built within a length of 300–350 yards. This factor governed the general layout of the site. There is a general service way running east to west which divides the site into two roughly equal areas, each being long enough to build any type of plant needed in the future. The manufacturing part of each plant is placed as close as possible to this service way. Storage buildings too, are placed so as to keep transport of goods at the site boundaries rather than have traffic in and out among the plant. Finally, no more services are provided at Rozenburg than each plant needs: the services are created centrally, but not on a big scale, as we go along. Each new plant is considered on its merits, and the services are provided accordingly. This keeps down costs.'

Finding people of all kinds brought a mixture of problems and advantages. 'Being on a new site as we are, I think it is still a tremendous advantage that we could select our own people from the start. And not being all that big yet, we find tremendous enthusiasm on the site and everybody tries to make the best of it, especially our young managers, who are prepared to work in circumstances that are not always easy. On the other hand, there is hot competition for people round here. Don't forget that while ICI is building and running their biggest chemical factory in Europe here at the moment, – we are not the only big company to put up plants in the recent past. Other big companies are competing fiercely. Then there is virtually no public transport – everyone has to come in by hired transport, which is costing us more as we grow. This site was farmland which is being industrialised very fast, and public services have naturally lagged behind a bit.

'There was a housing problem too, of course. Here both central and local government in Holland have helped very much, and up to now we have always been able to offer those joining us a house or a flat. Some 800 houses are now at our disposal for renting.'

Being new sometimes means that some problems are simpler, and that better, more workable patterns can emerge. 'Starting outside the UK, we decided in principle to run Rozenburg as an entity, so that Divisions don't have separate works. This, we feel, was a profitable decision, if only because it made possible a much greater exchange of information between the various plants concerned. There is no demarcation, either, for example, on this site, at any level or between any occupations. So everyone gets a chance to be versatile, and although they have their opposite numbers in Divisions, they see themselves as ICI people rather than Plastics Division, Dyestuffs Division, or Mond Division. Since January this year, too, everyone here has been paid a monthly salary and we are looking into the problem of making other conditions of employment similar for all the employees on the site.'

Perhaps there are more ways than one in which tomorrow is being created at Rozenburg.

iciroz

step by step

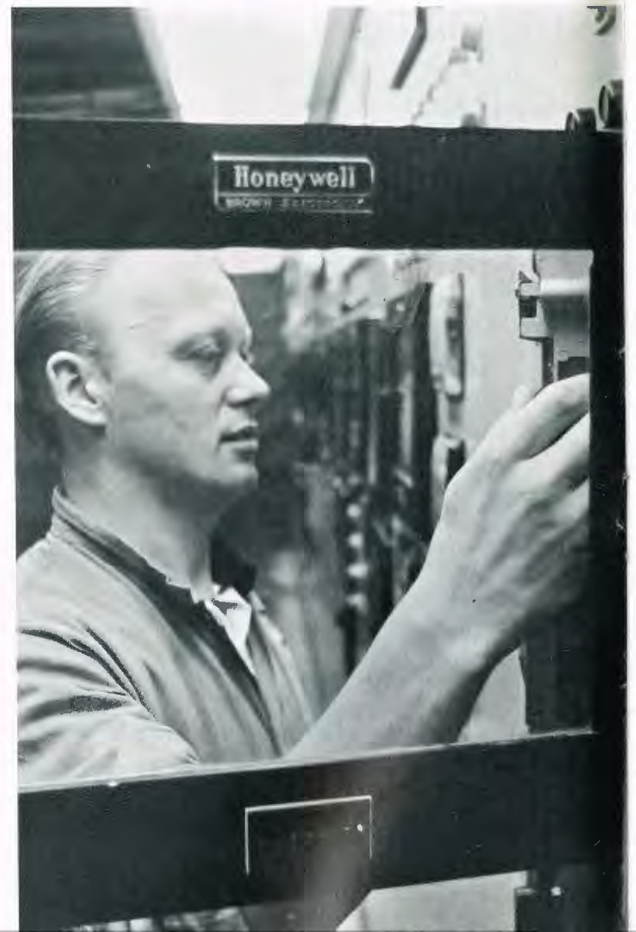
1961	February	Rozenburg project announced
	July	First plants announced
1962	May	First pile driven
1963	November	'Perspex' and 'Diakon' plants commissioned
1964	July	Nylon polymer, 'Alkathene' and 'Melinex' plants announced
1965	August	ICI (Europa) announced
	September	Nylon plant on stream
1966	March	'Alloprene,' 'Alkathene' II and 'Terylene' polymer plants announced
	May	'Melinex' plant completed
	August	First ship berthed at Britannia Harbour
	September	'Alkathene' I started up

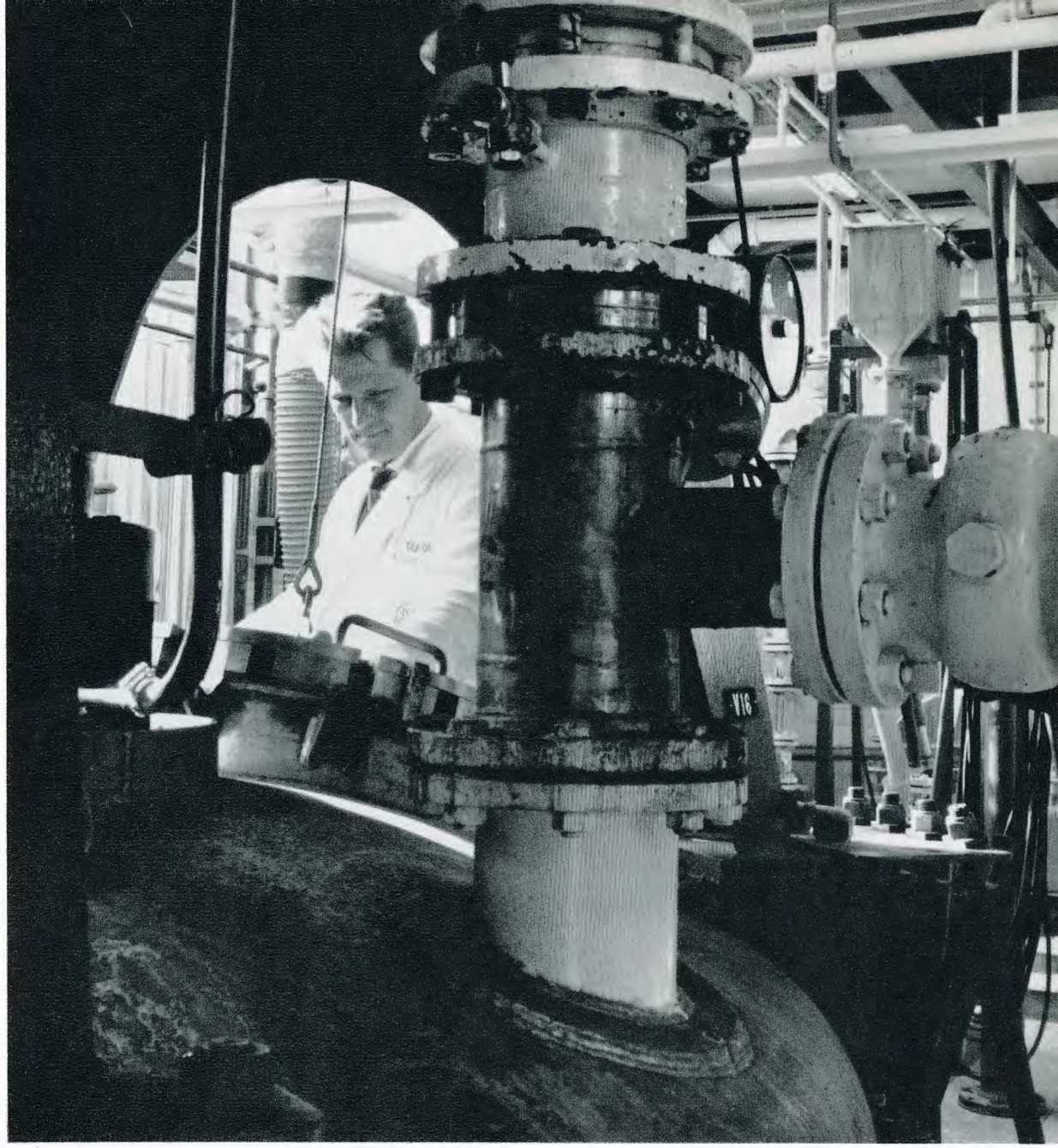
'I would like a sign on the door saying: Interested only in bad news and bright ideas': Ton Van Namen (below), Works General Manager, Rozenburg

production people

As Section Manager of the 'Perspex,' 'Transpex' and 'Diakon' plants, 28-year-old Bob Monster (right) is relatively young for the complex job he holds. 'While very interested in the technical side of production,' he says, 'I am even more interested in the economic side, getting costs down as low as possible. This is the most difficult (and to me therefore the most fascinating) problem: you have to deal with so many variable factors, which taken together decide the cost of your product. Then again, as a technical man, you want to make it as perfect as possible, but this is no good because you have also to make it as efficiently as possible. To my mind the two things are and must always be completely different.' Trained first in mechanical engineering at the University of Delft, Bob Monster also gained a good general grounding in a number of other sciences. He joined ICI (Holland) two and a half years ago.
Which product, we asked him, was the most difficult to look after? ''Perspex,' because you have to deal with so many varieties, with thicknesses ranging from one millimetre to ten millimetres, and about 100 colours too. These colours fall into several groups, all of which need a specific formula and a special polymerisation process. On the selling side, which is even more complex than production, there's an enormous number of small orders, and you have to meet a laid down standard exactly every time. If a customer has a sign in Paris, Frankfurt or Rome, and he wants to replace it three years later, he will want exactly the same colour, exactly the same weathering qualities and so on. Here we are selling mainly to the EEC countries. And there's been quite an increase in sales inside the Benelux countries: the 'Perspex' for many road signs in blue and white in Rotterdam and elsewhere on the road system was supplied from ICI (Holland).'

A pigment blender in the 'Perspex' plant, Henk Appel (above) deals with some 120 colours in all – 80 for 'Perspex' and 40 for 'Diakon.' Aged 43, he was in the colour side of the paint business before joining ICI (Holland) in 1963. He spent six months training for the job at Billingham. 'We sell quite a lot of red at the moment, also blue and green. I enjoy the development of new colours, too – when a customer gives us a colour and we have the challenge of matching it. All our formulations come from England.' Almost from the beginning Henk Appel was a member of the editorial committee of 'Spreekbuis' (Speaking Tube), the house journal of ICI (Holland) with 1,400 circulation, founded in 1964. 'I write about people's hobbies, about chess, travel, holidays, sightseeing – we usually have to write most of the magazine ourselves.'





Like several of the people we spoke to on the Rozenburg site, 28-year-old plant controller Aad Colpa (left) has a background of service with the Dutch merchant navy. It looks as if life at sea, with its orderly routines and increasingly technical pattern, is a useful preparation for control work in a modern chemical plant. He was a ship's engineer before joining ICI (Holland) in June 1965. Not long after becoming a nylon operator he made a useful suggestion which brought him an award of 1,000 guilders (£100) from the Company. It resulted in better yields and also considerable savings in raw material.

Nico Janssen (above), a shift foreman, sets the temperature for the 'Diakon' autoclave (pressure vessel) in order to complete an otherwise automatic polymerisation process.

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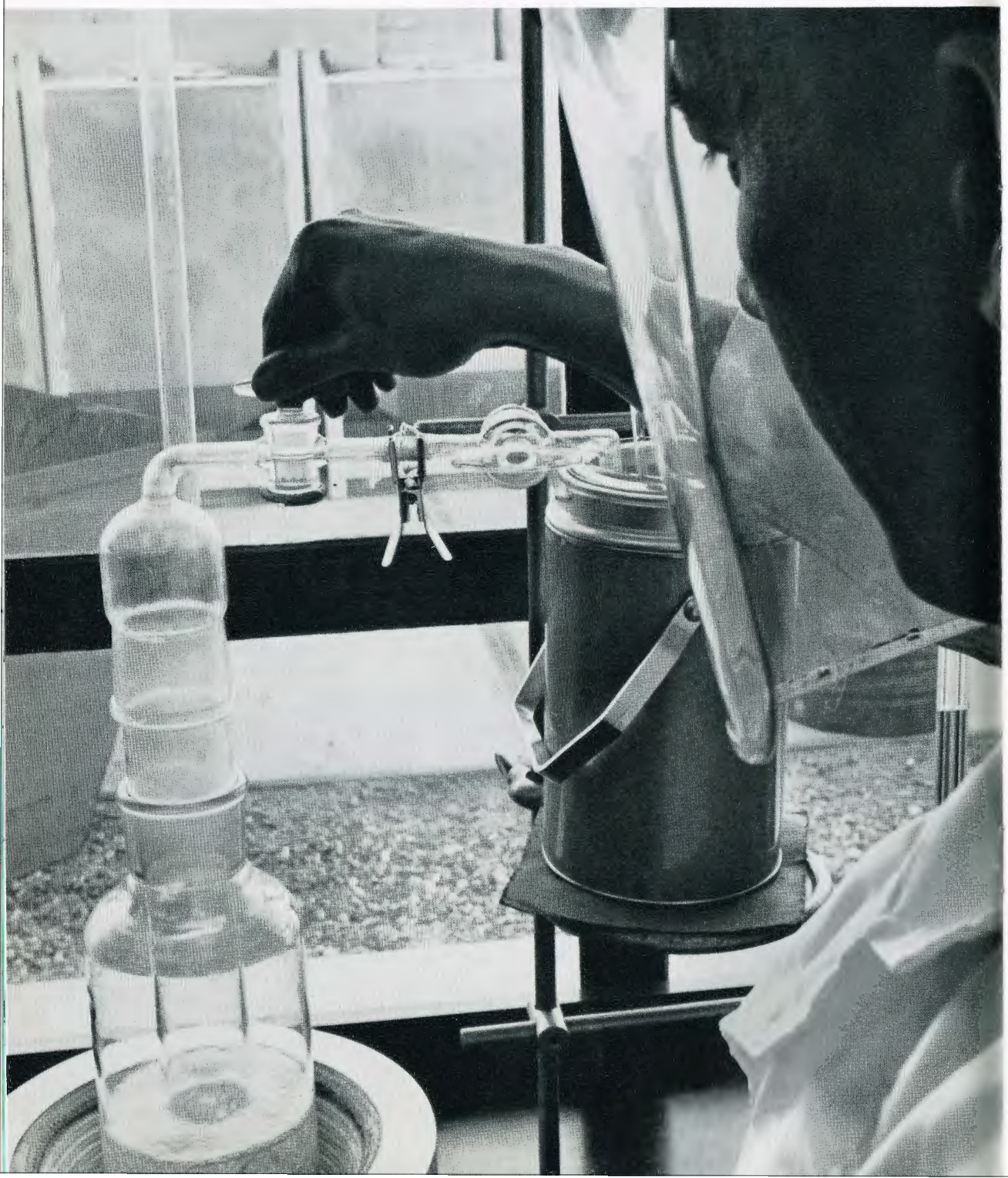
production people

George Meijer, laboratory assistant, determines the moisture content of a compound in the 'Melinex' plant chemical laboratory. A tough, clear polyester film, 'Melinex' is being more and more widely used for magnetic recording tapes, to insulate electric motors, as a base for photographic films, and in colour printing. Since 1963 ICI have been Europe's biggest producers of polyester film.



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the engineers

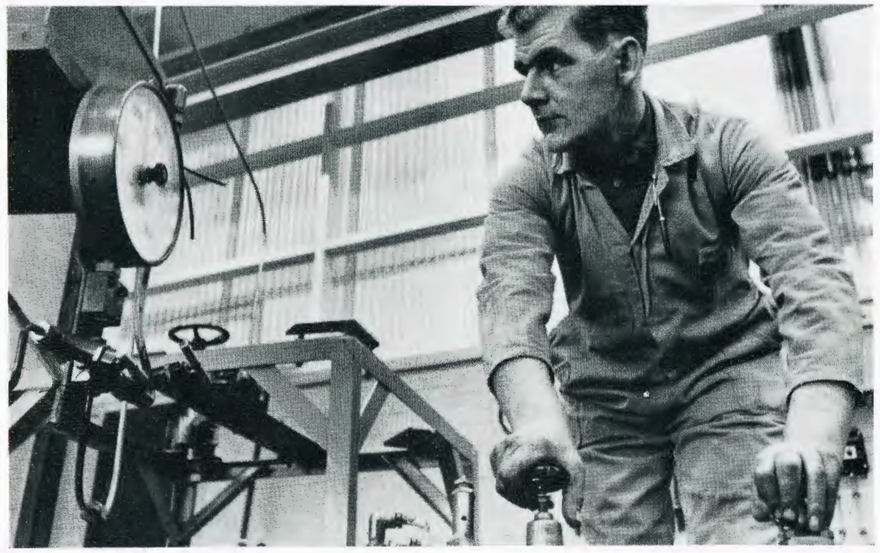
Dolf Bakhuis (right), **Civil Section Manager, has lived with the Rozenburg venture since February 1962. That is, from the days when the filling-in materials went in to raise the level of the land, and later the piles went down on a bare site, until today, with five of eight projected plants in production and two or three of those turning out thousands of tons of plastics a year. One suspects that, like many civil engineers, he hankers a little for the days when most of the obstacles still lay ahead and the power of man over the land was seen at its strongest and simplest.**

'We have basically completed all our plants on time, not only the civil engineering, but the mechanical and electrical too. The great struggle is always to get people to make up their minds in time on what they want and stick to it without wanting more changes. Technically, the thing peculiar to this site is that all our buildings have had to be piled. Not just a matter of a few metres, but up to 30 metres (100 feet). No problem to a Dutch engineer, but it adds to first costs. The site had to be drained too, with vertical sand drains to get quicker settlement.

'This vertical sand draining makes it possible to put up large buildings within a few months of filling the site, instead of several years later.'

By training and first choice Dolf Bakhuis is a hydraulics expert. Aged 46, he worked for a number of contractors, including an oil company in Saudi Arabia, before joining ICI (Holland). 'With one contractor I was in charge of the Delta Works at Haringvliet, where they built the discharging sluices. My speciality is with water. Yet you could say that is why I am here on the dry for a change. But with water, as soon as we are building a jetty or something like it, my heart jumps for joy.'

A major problem of site conditions with which he has been closely concerned is windblown sand on this flat, exposed piece of land near the North Sea. The answer was found by putting down a species of grass which is not only rugged in itself but can live in industrial conditions: 'Since several of our plants, 'Melinex' for example, must be super-clean, the blown sand from the surface of the ground must be kept down. So every time we reclaim land we put down special vegetation known as Eurograss to hold the top soil. It is really a mixture of coarse, strong plants developed for this salty, sandy area here. And we do not need to keep it low because it naturally keeps itself low.'



Yet another man from the sea, Hugo Kramer (above), **was second engineer on a Dutch merchant ship for eight years, where he learned many different maintenance skills. He has also worked on engines in the fierce heat of Africa, at Dar-es-Salaam and also in the interior of Tanganyika. Here at Rozenburg as a fitter he has to cope with dozens of different maintenance tasks arising from daily wear and tear in the plant. Has also worked at Milan in Italy, where he tells us he spent nine months eating ravioli and spaghetti and only drank one glass of beer in all that time! Meanwhile Mr. Kramer has recently been selected as a shift process foreman for the 'Terylene' polymer plant.**

Equally vital is the sort of job carried out by Bas Anemaat (above, right), **Mechanical Supervisor, Engineering Department, European Project Group. As each plant goes up he watches over the standards on the mechanical side of the construction: piping, installation of mechanical equipment, correct alignment and so on. Also the costs of construction on building work charged by the hour. He has studied welding techniques and heat treatment of materials, and has a lot of experience in mechanical installation in ships and the boiler building industry, where he worked for over 10 years. He joined ICI (Holland) in January 1965.**

Europe this way

At the end of all the production lines in Rozenburg stands the distribution manager, Job Onderdelinden (right), whose task has grown with the completion of each plant and the unfolding market strategy for ICI (Europa) as a whole. Aged 45, he was an officer in the Dutch Merchant Navy for a short time, and had reached Second Mate when the war began. He worked as an accountant with the Rotterdam Chamber of Commerce and went into shipping and forwarding before joining ICI (Holland) in March 1951. He looks after all distribution from ICI (Holland). This includes not only the Dutch company's locally-made products but other ICI products imported from the UK. In touch with production, with sales, with Divisions at home and with customers abroad, his job reflects the diversity of the chemical industry itself.

'Speed is one of the main factors in all distribution, but particularly so in this part of the world. We are not the only European manufacturers of these products. Over ninety per cent of what we make here goes out to European markets by road. Deliveries extend from Germany to the south of Italy and also overseas. Demand from each country varies widely from product to product. For France we use a rather newly developed delivery technique, combining road and rail services. This is the "piggy-back" (here called "kangaroo"): the lorry, loaded with 'Alkathene' in bags, rides on the train and delivers to customers in the Paris area in just about 24 hours.'

Equally familiar with all forms of transport, road, rail, seaways and inland waterways, air freight, and with container techniques, he also has to pay a lot of attention to the commercial side of the job: how and why the customer wants his goods – and what production can or cannot be expected to achieve in a given time.

'One reason why we use road so much is that we are confronted with the need for direct delivery far more than when most of our supplies were made in plants in Britain. We are now considering the possibility of our own rail siding. One of the reasons we chose this site was the water connections into the North Sea one way and Europe's inland waterways the other. At the moment we only use the sea connection for the supply of ethylene, although we are seriously considering sending ships up the Rhine for the main bulk products of the plant like polythene.

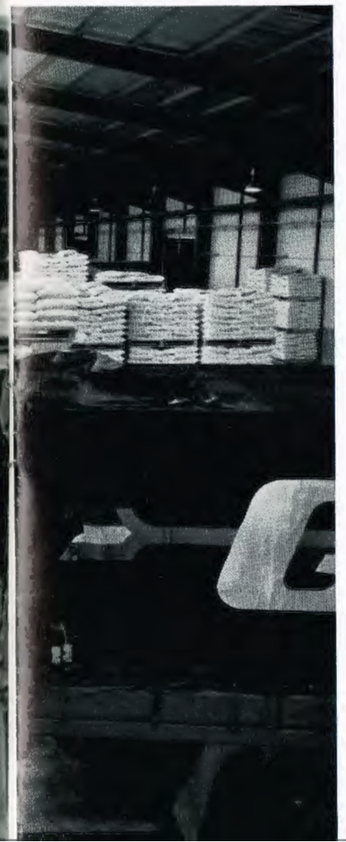
'On water transport too we in ICI (Holland) have acted as a forwarding agent for some Divisions for years, particularly for HOC, for example. We carry considerable Continental stocks of bulk liquids. Recently a new system has been developed of feeding the plasticiser factory of ICI (France) near Verdun, by water. This has been going about four months: it is slow, with a round journey of some 20 days by each barge carrying about 250 tons of iso-octanol. But it saves a lot of money.

'Nor could we do without air freight. Some products may be in short supply and are sometimes needed very quickly: dyestuffs, for example, or titanium metal. But the need is growing less because communication by sea ferry has greatly improved and is now becoming so much better than air freight on the short distances.

'The Tote Bin container system, using these strong light bins both on the production line and for transport, has proved useful at Rozenburg with nylon polymer chips. The nylon polymer for Oestringen goes in Tote Bins, each holding about 1½ tons: the average loaded lorry holds some 22 tons net.' The principle will probably be extended to 'Terylene' when the new plant comes on stream. 600 bins are used for the nylon polymer, and there will probably be another 600 for the 'Terylene' going to Oestringen.

'And for plastics like 'Diakon' we are using about 100 'Plasbins,' the container specially developed by ICI Plastics Division and made from polythene with steel reinforcements to give rigidity.'

Up to 100,000 tons a year of liquid ethylene is exported by tanker from Tees-side for processing at Rozenburg's 'Alkathene' plant. Later this year the total traffic entering ICI's Britannia Harbour alongside the site will be 2 or 3 ships a day. It is the Company's share of Rotterdam's 'Europort.'



Left: **Bags of 'Alkathene' granules for the markets of Europe are loaded into a lorry by fork lift truck in this warehouse**

Above: **A vehicle loaded with bags passes by the bulk storage containers on its way out to Rotterdam and beyond**

Overleaf: **Douglas Bell, Chief Executive ICI (Europa), puts Rozenburg into perspective**

43 boulevard du Régent

From ICI (Europa)'s Brussels HQ, the Chief Executive, Douglas Bell, puts Rozenburg into its British and European perspective

Editor: *How does Rozenburg reflect ICI's overall strategy, and ICI (Europa)'s approach to the markets of Western Europe?*
Bell: As we all realise, the limited size of the UK market, and its very slow growth, have long caused the Company to seek new outlets for the larger and larger scale of output produced by the most modern and efficient plants. So we have turned more and more to overseas markets, among which Europe is the fastest-growing. But here in Europe too ICI faces massive competition from all the world leaders in chemicals for a share in this, the most prized market in the world. There has been very big investment by Europeans and Americans alike – and don't forget that the six major European companies are more or less in the same size league as ICI and the top six in USA. While our own export business has grown by 15 per cent in Europe every year for many years, the effect of the common external tariff imposed by EEC countries is beginning to bite. Our manufacturing investment at Rozenburg is one of the things we are doing to avoid this 15–20 per cent tariff, to save transport charges, and to obtain for ICI a satisfactory share in the market.

Editor: *Is this why the ICI Board decided that the Company should manufacture more chemicals inside these EEC countries?*
Bell: Yes, but there are other, equally basic reasons too. We think that, wherever we can, we should exploit our best discoveries, rather than license them to others, so spreading our research and development costs over a larger market and larger output. We also wanted to find outlets for the basic chemicals being made in the new, very large plants at Billingham and at Wilton, for example. Above all, if we are to market our future products effectively in Europe, we need a strong manufacturing base here in addition to our already well-established selling companies in each country in Europe.

Editor: *How does Rozenburg reflect this policy?*
Bell: It shows how selective our attack on the market is – and also how closely-integrated our operations are with the Divisions at home. We picked five of our leading products with good growth potential in Europe, plus a few smaller specialities, and we built plants in the EEC big enough to compete with local or with American competition there. And our 'five for Europe' – polythene, 'Perspex,' 'Terylene,' 'Melinex' and nylon – are all being made from intermediates shipped by Divisions from Britain. This brings three advantages. We preserve for UK basic operations the economies of scale secured by the extra volume needed to supply these outlets in Europe; we reduce the duty; and we make a contribution to exports. Taken together with investment allowances and grants, our investment in bigger plant in the UK is beginning to give us a competitive edge in basic chemicals. This is the foundation on which our EEC plants are built to get extra markets and profits for the main investment at home.

Editor: *In what other ways do you link up with Divisions?*
Bell: Not only does our whole pattern depend on first-stage chemicals made in the UK: what we do on the Continent immediately affects the market place in the UK. The stuff moves around: for instance 'Terylene' sold in Austria is processed there into yarns which are then sold in Sweden, where it is made into cloth which is sold in the UK. Our operations are more deeply-integrated with Divisions than anything ICI does in Canada, Australia or South Africa, for example. Initially we chose Rozenburg because it was so well placed for shipping, opposite the Tees, and could be planned as a forward base to carry out the final processes within the Common Market.

Editor: *What about the balance of manufacturing between yourselves and the home Divisions?*
Bell: Some people in Divisions see ICI (Europa) as a rival to what they themselves are doing: they think that while they want to export more output to Europe, we want to make it inside Europe, and so cut off their exports. This is not so. If a Division wants to build a plant to supply stuff for Europe, we are delighted. Recent examples include the silicones extension of Nobel Division and their pentaerythritol extensions, both directed at Europe. We're happy to help them sell the output. Incidentally, in order to sell more effectively and to relate long-term effort more closely to Divisional needs, we have been absorbing our sales agencies into our own national selling companies and now do nearly all our own selling.

Editor: *How much is being produced in Europe, then?*
Bell: The proportion of ICI products made on the Continent for sale there was only 16 per cent this year; but four years ago it was nil. By 1970 we plan for it to reach 40 per cent. It's growing, but it is tiny compared with the proportion of locally-made products sold by ICIANZ in Australia – 80; or by CIL in Canada – about 90.

Editor: *How has capital expenditure been running?*
Bell: In the six years since the decision to build in Europe we have spent nearly £40m. on plant, about equally divided between Rozenburg and Oestringen. When we started we thought that about £100m. would be spent in the first decade, and this still looks about right. It takes about two years to build a plant and another two to get it to a profit-earning state in the UK, and we have the extra difficulty of attacking new markets on the continent, so we have to be patient – this is one of the great advantages of being part of such a large company.

Editor: *Which projects are likely to pay off soonest?*
Bell: This is not easy to answer. Some of the profit is taken by the Division supplying the intermediates, then there is a royalty for the process and other help given, and selling commissions earned by the European selling companies–all of them complicated by tax questions. But although competition here is much tougher than at home, I am confident that we will be earning by the end of the first decade the same sort of return that ICI achieves in the UK, if only because we are free of some social and customer pressures and because we are able to concentrate so intensely on the things the Company does best. Altogether it should be remembered that ICI aims at spending only about 1% of what Common Market countries are spending on chemical plants. By concentrating on a few products we plan to be really successful in them and obtain a 10–20% share which will equal in volume our higher share of the smaller UK market for the same products.

Editor: *Taking operations as a whole, when do you see 'the end of the beginning'?*
Bell: This year we hope to do two things. We hope to get out of the red in our manufacturing operation in the second half of the year (the financial year here runs from October to September). Second, our turnover should achieve the figure of £100 million. Most of this is UK exports, of course. Next year we should start making a profit – an important milestone for us – one we shall have reached rather quicker than some other companies starting up manufacture in Europe.

Editor: *Finally, how does operating here in Europe differ most from operating in Britain?*
Bell: We're inside an economy growing at least twice as fast as the UK economy can hope to achieve, while the chemicals industry here is growing twice as fast again. This makes it possible to plan ahead with much greater confidence in the future, in a growing market where we can see our place. This compares very favourably with the stops and starts of Britain's economy! The whole outlook will alter if Britain succeeds in joining the Common Market. The ICI strategy for Europe has been devised as the best preparation for the long-term future whether we join or not.

(above) **Some senior people. From top left: A. Stabler, Chief Accountant; J. T. M. Davies, Commercial Co-ordinator, now Head of ICI (Belgium) S.A.; R. Malpas, Deputy Chief Executive; J. B. Kitchin, Deputy Chief Executive; D. M. Bell, Chief Executive; T. E. Smith, Secretary; T. Howie, General Manager, Fibres; C. A. C. Petrie, Chief Engineer**

(left) **'The total operation tends to be international,' says Douglas Bell. Six ICI (Europa) executives, six nationalities. Left to right: Dr. Paul Löser, German; Ronald E. Kreling, Dutch; Dr. Eugene Hofmann, Swiss; Dominique Taupin, French; Dr. John A. Coles, British; Michel Snoy, Belgian. Of 65 staff, 38 are British, 15 Belgian, 6 Dutch, 2 German, 1 French, 1 Swiss, 1 American and 1 a New Zealander**

Photographs: John Chillingworth

productivity and profit

Graham Hutton

Industrialised or developed countries, wherever they are, East or West, have all become 'advanced' for the same reason. They turn out their peoples' standards of living, the highest in the world, by a capitalist system of production. This system depends more and more on machines, buildings, communications and other technical equipment (capital) and on human brains and learned skills (manpower, research, management) and less on brawn. No matter how their systems of government differ, the managements of all these countries, in state or private undertakings, have to mix 'the five M's' – men, machines, materials, motive power, and managerial know-how – as effectively as they can. And they all have to use money to measure their costs and their returns.

In all advanced countries (including Russia and her European associates) a surplus of revenue on balance must be earned over the total costs of all items of input. You don't need to call it profit, but it *is* a surplus over all outgoings or costs. It is one of the vital sources of all savings: 'profit' ploughed back into production. Individual savings are naturally more important in the 'Western' countries, though not more so, on balance, than companies' ploughed-back profits. *Personal* savings are invested both directly by the savers themselves, or indirectly by savers who entrust their savings to such institutions as life assurance or other insurance companies, pension funds, or trade unions' or friendly and building societies' funds.

Now capital resources have always been relatively scarce compared with mankind's unlimited wants. The most industrialised nations have built up the most capital apparatus through 'savings.' Savings are available resources which are turned into productive capital for long-term use and called producers' or capital goods, and which are not just immediately used up by consumers. The more capital equipment and power behind each pair of employed elbows, the higher the output of each pair of hands. That has been true since the first time man found a stone or stick a help as a tool and stuck to it for long-term, productive purposes. And it is why the American statesman-scientist Benjamin Franklin two centuries ago called man 'a tool-making animal.'

All forms of productive capital are really tools: buildings, plant, vehicles, machine tools, docks, ships, roads, railways. They wear out. They are also made obsolete by improved versions or new inventions and production methods. So a country must not only accumulate its productive capital apparatus by some form of current saving, or borrowing and then repaying out of the higher output made possible. It has also to put by some current saving to 'depreciate' over the years, so that when the useful life of the equipment or building or other capital goods has ended they can be replaced with something more efficient.

So you get *additions* to a nation's accumulated stock of productive capital apparatus ('growth' investment) and *replacements* of worn-out, obsolete or inefficient parts of that apparatus. These two sources of capital are always being combined by managements – together with the most effective 'mix' of 'the five M's' – to turn out the highest quantity of highest quality products that can be made from the 'mix' and profitably sold (i.e. to get a surplus over *all* costs of the input). The instrument available to managements to measure costs and the varying efficiencies of each and every item of input is productivity: how much each of 'the five big M's' contributes to profitability (or the reverse: wastes, deficits or shortages).

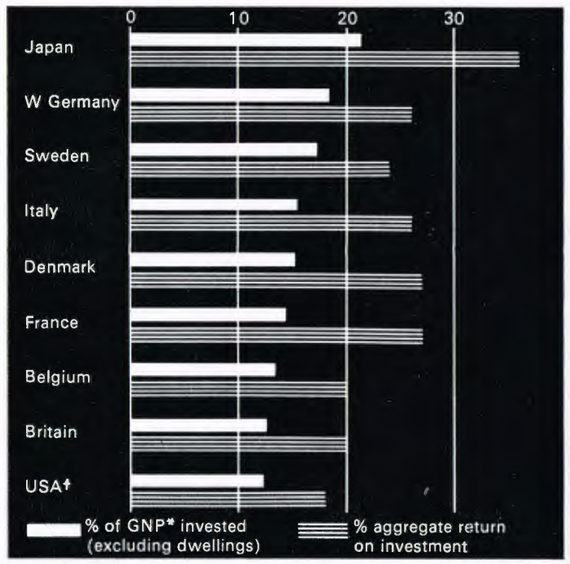


Table 1. Comparative investment in nine countries, 1955–64

* Gross National Product, the total value of all goods and services produced.
† The US capital stock is far higher than in other countries: over double what it is per head of population compared with any other country. The investment ratio is low partly because the US economy was stagnant in 1960–61.

By carefully measuring the money costs of so much of *each* item of the input 'mix,' all managements (in state and private enterprises alike) try to cut down wasteful uses, and step up the more productive uses, of each of 'the five big M's.' This really means keeping quality up but striving to keep all input costs to their essential minimum, so that selling prices to customers can also be kept as low as possible, and thus the greatest volume of sales (turnover) and throughput can be obtained. Tons of fuel or raw materials, hours of managers' and operatives' work, hours of machines' available capacity, costs of advertising, marketing, transport and bank overdrafts or other financing – all these items of input vary in the 'mix' all the time.

Good managements aiming at growth and progress get regular reports of each item's productive contribution in £ s. d. to the end product's total cost, i.e. each item's productivity. The more the productivity of each item can be raised, the higher the firm's competitiveness, the quicker the progress in sales and output, the more efficient, the more 'profitable,' the private or public enterprise becomes. The most important result to that enterprise, to its customers, its employees and its country, is that it can sell more competitively and cheaply, pay its employees better, make good profits (to pay taxes to the state and dividends to its shareholders) *and yet also* 'plough back' more of this profitable surplus into more and newer capital equipment. For every country this combination of productivity and profitability is the key to progress.

Let us now look at Britain's specific performance, compared with that of similar nations, over the last dozen years.

The National Economic Development Office put in some background papers for the Prime Minister's National Productivity Conference last autumn. Among them was Table 1.

About this table the NEDO said: 'A strong relationship is assumed between a country's rate of economic growth and the proportion of its income that is devoted to capital investment. On both counts Britain ranks lower than almost every other industrial country. A substantial increase in investment is thus seen as the key to higher output per man and hence to faster economic growth.

'It is not just the quantity of investment that matters. Its quality is just as crucial. This means the return that is earned both on new investment and on existing capital equipment. The statistics strongly suggest that countries like West Germany have out-performed Britain not simply because they have obtained a higher return from their investment. The implication is that either our new investment is somehow inferior in quality, or the best use is not being made of it, or that a combination of these two factors is responsible.'

If the results in Table 1 were now updated, Britain's would have fallen further and all the others would have risen (the USA's rising above ours).

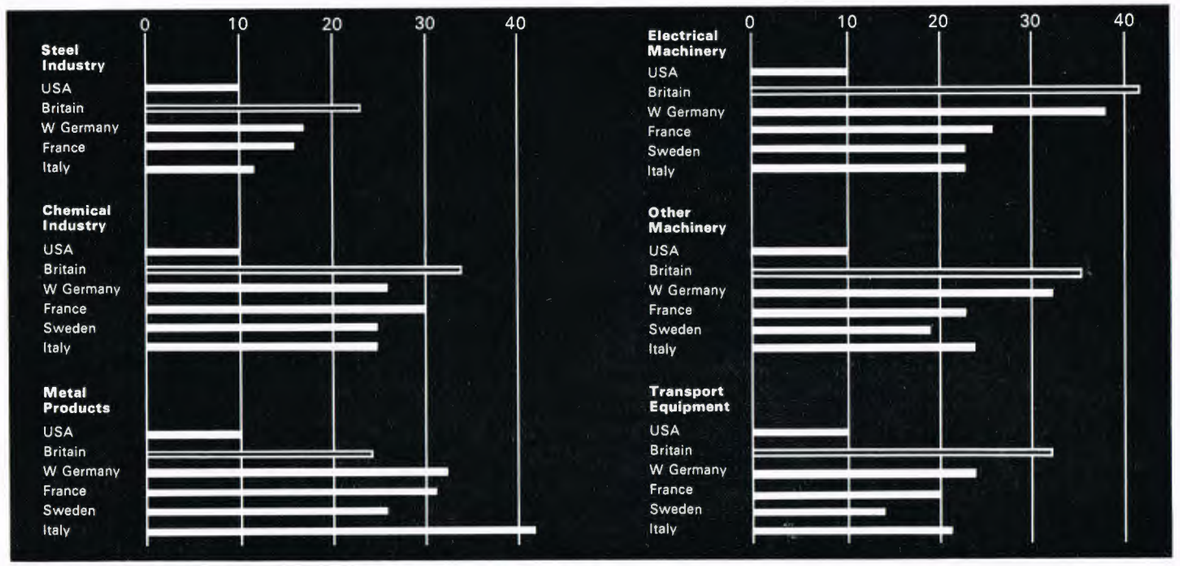


Table 2. Number of men required to produce same output (USA = 10)

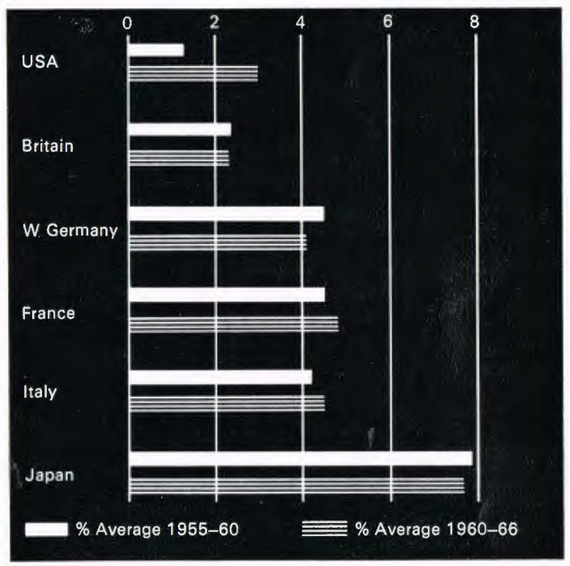


Table 3. Average rates of increase in output per person employed

The paper listed these factors on which it said the level of the return on investment depended:

(i) it should be matched to the expected demand for its products closely enough to make sure that it would be operated to its fullest capacity or productive potential;

(ii) it should not be overmanned (or the waste of manpower would offset the new equipment's productivity);

(iii) the most efficient managerial practices should be adopted so that maximum output would be obtained from the minimum of resources (while maintaining quality).

In the NEDO papers was another table (Table 2). Now figures for 'output per man-hour worked' as between countries are subject to considerable margins of error. But if you use the same measuring rod for all over a good run of years, you reduce that margin. Moreover you do show up comparative national performances more clearly. Table 3 is based on work by the Organisation for Economic Co-operation and Development, which includes most West European nations, the USA, Canada and Japan. This suggests that our NEDO's Table 2 is pretty nearly right, and that something is wrong in Britain.

But manpower is only one of 'the big five M's' of input and costs. What of capital, machines and fixed plant, and

motive power? In Table 4 is a breakdown of what we did invest in from 1955 to 1966 – *kinds* of new capital built or installed, and the industries, trades or end uses it went to serve.

If we look back now at Table 1 we immediately see one striking point. Britain has put a smaller proportion of her national income into new investment, yet a bigger percentage of that proportion has gone into housing. The amount of gross national product saved and invested is smaller, yet compared with others she has put more of the total into *everything other than manufacturing*.

Table 4 shows the main trends (in 'uninflated' £'s of 1958 value) in our total new investment as a nation over the last few years. They do not promise us much productivity, profitability or progress, and all our leading economic institutions are worried by them. Here they are:

(i) a long general rise in the *total* of new capital invested, with a fall last year and another threatened fall this year;

(ii) a rise in *public capital expenditure* from taxes, rates and public borrowings, especially for council housing at subsidised rents, fuel and power (particularly coal and electricity), public transport and *public services* in general;

(iii) a corresponding slowdown, and a downturn this year, in total investment by *private enterprises* in all kinds of new fixed capital, including retail trades and service industries;

(iv) a slower long-term rise, and a still sharper recent downturn, in new capital investment in *manufacturing*.

We have a higher proportion of our working population engaged in manufacturing (26·5%) than the USA (15·1%) or any other 'advanced' country (Western Germany and Switzerland come nearest at around 24%). The new Selective Employment Tax gives a premium to all UK 'manufacturing' employers to use or hang on to *more* employees rather than to make the 'labour cost' item of input more efficient in keeping down production costs and, ultimately, prices. But higher exports at competitive prices are vital to our balance of payments, the recovery of sterling, and the desired re-expansion and growth of our economy; while 'manufacturing' by private enterprises provides five-sixths of our exports. So, looking back over all these tables, we get these clear messages: first, the *private* sector has to finance from taxes and other state levies heavily-increased new capital programmes for the *public* sector for some years to come, which reduces private profitability. Second, increased productivity in *public and private* undertakings of all kinds, not just manufacturing, would help to keep all costs, prices and public taxes and charges down, and help to restore the profitability of private enterprise. And finally, success in cutting costs, taxes, etc., would yield the extra productive capital investment needed by private enterprises to help raise our lagging national productivity figures. This would help to boost exports, to restore growth, and also to finance the heavily-increased public sector's *less productive* capital programmes.

Two final points, in case anyone should think I am opposing the 'public' to the 'private' sector of our 'mixed' economy:

(i) '*. . . some 52% of corporate profitability will disappear in taxation (40 per cent corporation tax plus some 41¼ per cent on, say, 50% of earnings distributed). The situation is therefore that the *community* is, in effect, the majority shareholder (in terms of shares of profit) in *all* companies. As the major shareholder it must similarly meet the larger part of the costs of inefficiency, which *reduces* corporate profitability and hence the total tax take. . . .'

(ii) Britain's private enterprises, especially in manufacturing, have shown over the last 15 years *lower profitability* after all taxes on profits, a *lower investment* rate in new productive capital and a *higher rate* of cost-and-prices rise than those of the USA, Germany, and many other advanced countries.

This is our national economic problem in brief, and apart from party politics. All of us have to solve it together.

*From *The Profitability of British and American Industry*, by Professor A. J. Merrett and John Whittaker. Lloyds Bank Review, January 1967.

Table 4. Gross domestic formation of fixed capital in £m. (1958 value)

	1955	1958	1961	1964	1965	1966 estimated
Capital Investments						
All vehicles, ships, aircraft, etc.	431	530	609	662	648	640
Plant and machinery	1,188	1,343	1,697	1,932	2,015	2,200
Industrial and public buildings and works	799	981	1,351	1,609	1,697	1,725
Houses, dwellings, etc.	689	587	813	1,089	1,118	1,130
Total	3,107	3,441	4,470	5,292	5,478	5,695
End uses						
Agriculture, forestry, fishing, mining, etc.	221	239	267	264	258	240
Construction and housing	746	649	898	1,211	1,237	1,250
Social and public services and works	243	321	469	680	700	760
Retail and service trades, etc.	398	457	704	887	902	900
Gas, electricity, water, transport, communications	707	853	937	1,172	1,205	1,320
Manufacturing	792	922	1,195	1,078	1,176	1,225
Total	3,107	3,441	4,470	5,292	5,478	5,695

escape me never

Ronald Ward

'Deux bières, s'il vous plaît!' It's thirsty work here in Paris. I was recently sitting outside a café, trying to forget 'it,' when there it was again . . . 'ICI'. But let me explain how it happened.

It's almost three years since I left ICI but never was I more conscious of ICI than since I have been living in France. Everywhere I seem to go here in Paris I'm reminded of it. 'Ici' in French means 'here.' Whenever and wherever I stroll I'm always confronted with it: 'ICI on parle anglais,' 'Passer par ICI,' 'Stationnement interdit ICI.' I'm getting a complex about it!

I'm not safe even when I'm in my college. One day coming out of an examination room I was confronted with a notice telling me to 'Déposer les papiers ICI.' If the examiner hadn't been looking I'm sure I would have yielded to the temptation and drawn the familiar roundel around the 'ICI.' It's getting to be an obsession.

I feel I ought to wander around Paris armed with a pot of blue paint and a brush and draw a ring round every ICI sign I see. Perhaps I could get a commission from the ICI Publicity Department. Certainly I would be locked up in the Préfecture of Police!

The Préfecture of Police! I wouldn't be safe even there. Just a snail's throw from Notre Dame it stands, and it's full of ICI signs. There's a department there for nearly everything, because ici . . . sorry! . . . here in Paris one needs some kind of authorisation for nearly everything one does. One collects innumerable cards and pieces of paper, and for nearly all of these one has to have a photograph. Frenchmen spend many francs and much time in having their photographs taken for their cards. For this reason the visitor to Paris will find automatic machines dotted everywhere – 'ICI 4 photos 1 franc.' – machines in which you sit, put in a one franc piece and wait while a light flashes four times. Some few minutes later you obtain your four photographs, which you can then stick on to your various cards.

Now it happens that I've got some Scottish colleagues here, and one day the four of them needed just one photograph each, for some card or other. They had noticed that in these automatic machines there was just enough time between each flash of light to change places with each other. So in went the first, in went a one franc piece, and in and out passed the four Scots in quick succession, the light flashing on each of them and producing the required one photograph each – at only 25 centimes a time! Many a French joke begins 'Il y avait un écossais . . .' The French are very fond of stories of Scottish thrift, and the bystanders who saw this example of thrift in action gazed speechless in wonder and admiration, their Cartesian minds for once a blank. 'Alors! Que se passe-t-il ici?'

ICI! You see, I can't get away from it! I tried to do so recently. I had a few days' holiday and decided to go into Germany with a colleague. We were going to try hitch-hiking for the first time. The start was not very successful. We found ourselves about four hours outside Paris, 'en pleine campagne,' walking along the N4 in the direction of Strasbourg. Traffic was very light. Suddenly, coming up behind us, we saw a tanker. 'He might stop and give us a lift,' we thought. But as the tanker approached I recognised the familiar sign and could do no more than stand back dumbfounded as the tanker went past – the ICI roundel on the back of it seemingly mocking me. This was too much! We went to the nearest station and caught the train into Germany.

The Black Forest was a beautiful green, and here I was free. I didn't see a single 'ICI.' But the freedom was short-lived, and I was soon back once more in Paris trying to avoid the 'ICI' signs and trying to overcome my obsession – but it's impossible!

If you ever come to Paris, look out for the 'ICI' signs – and look out for me. If I'm not in the Préfecture of Police I'll probably be sitting outside a café with a pot of paint and a brush, and . . . oh yes . . . 'Encore deux bières, s'il vous plaît!' It's very thirsty work ICI in Paris!

a river on the payroll

Peter Hewitt

The river Colne rises on the eastern slopes of the Pennines and hardly has time to become a full-blooded river in its own right before it is joined by another river, the Holme, at Huddersfield. From there, together with the Lees Head Beck, it makes its way through to the Calder, which flows east to join the Aire at Castleford, finally flowing out through the Humber estuary.

Just before the Colne joins the Calder, a couple of miles north-east of Huddersfield, it flows through the largest of Dyestuffs Division's factories, known locally as Dalton Works. The first factory was put up in 1916 on what was then a rural site, by the British Dyestuffs Corporation to produce the dyestuffs required during the first world war. In the following years some changes took place, the most significant of which was the incorporation of the company into ICI. But despite the changes – the growth, the application of new manufacturing techniques, the installation of new plant and equipment, the improvement in working conditions, the utilisation of a modern scientific approach, the ever-widening range of products (today numbering 3,000) – one thing has remained constant throughout. That is the river. True, it has its foibles. From time to time it becomes over-generous and overflows its banks, and there are many in the works who have seen a boat being rowed along the main avenue. Sometimes it is too niggardly, and this can cause problems, as we shall see. Or it can be too warm, or too cold; for the river is a living thing, and as such it has its moods.

For Dalton Works itself the river is not just a part of the landscape nor — at the other end of the scale — is it a hindrance, an embarrassing trespasser on valuable land, to be dammed and diverted. Rather, the Colne is an essential tool in the production processes at the works. Without it the works would necessarily cease to function until an alternative supply of water could be found. Such an alternative would be difficult to come by, because the works uses as much as a million gallons of Colne water — give or take the odd gallon — *every hour*. Perhaps 'uses' is the wrong word: 'borrows' would be better, because virtually all the million gallons are returned whence they came, back into the river itself.

The vital job this water does is to cool: virtually every process in a chemical factory like Dalton Works depends upon heat for manufacturing, distilling, mixing, drying and so on, and wherever you have heat you must have some means of cooling. If you can wait long enough, or if you have the necessary equipment, air is the cheapest form of cooling, but it does have its problems. The next cheapest (especially if you have an abundant supply already on the premises) is water. And so it is that the water from the Colne becomes as essential to the works as the main electricity power cables.

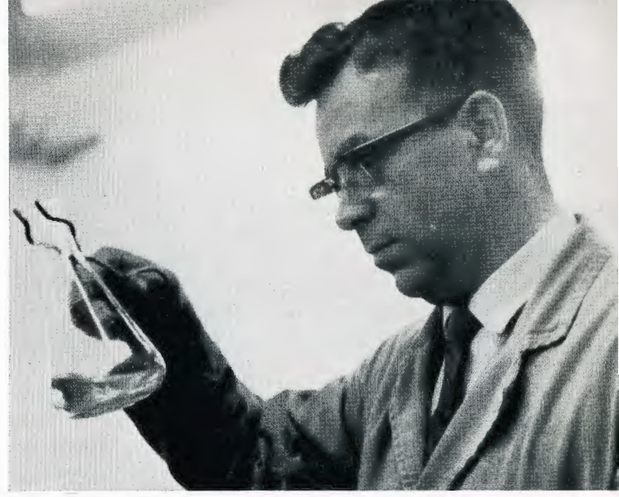
Pumping stations along the bank of the river suck the water out, screen it to remove any debris, and then distribute it through a network of underground pipes all over the works. But since its purpose is to cool, it must be cool itself. And so regular tests are carried out to determine the temperature of the water, and if this rises above 20 degrees centigrade it is passed over cooling towers before being sent on its way to the processing sheds. A number of water-cooling towers have been built over the years, and with the projected expansion of the works in the future it seems certain that more will be needed. It also seems likely that such expansion will go beyond the point where the Colne water is enough to meet all the demands made upon it, in which case means will have to be found to use air as a coolant.

Even now there is less water available from the Colne than in years gone by. There are two main reasons for this: first, because reservoirs have been built near the source of the river to divert it for other purposes, although the water authorities are obliged to provide a compensatory flow between certain hours. Secondly, Dalton Works is not the only user of water along the river's length. A number of mills have traditionally used this water in the manufacture of wool. In some of these processes the water becomes polluted, and in past years this was pumped back into the river: today, with the anti-pollution laws now in force, the mills are obliged to divert this effluent into the sewers, which means that it is lost to the river. The river water is a precious commodity for everybody who uses it, and in order to protect their own interest numbers of mill-owners' committees have been formed (a representative from Dalton Works sits on five of them) to ensure that they all get a fair

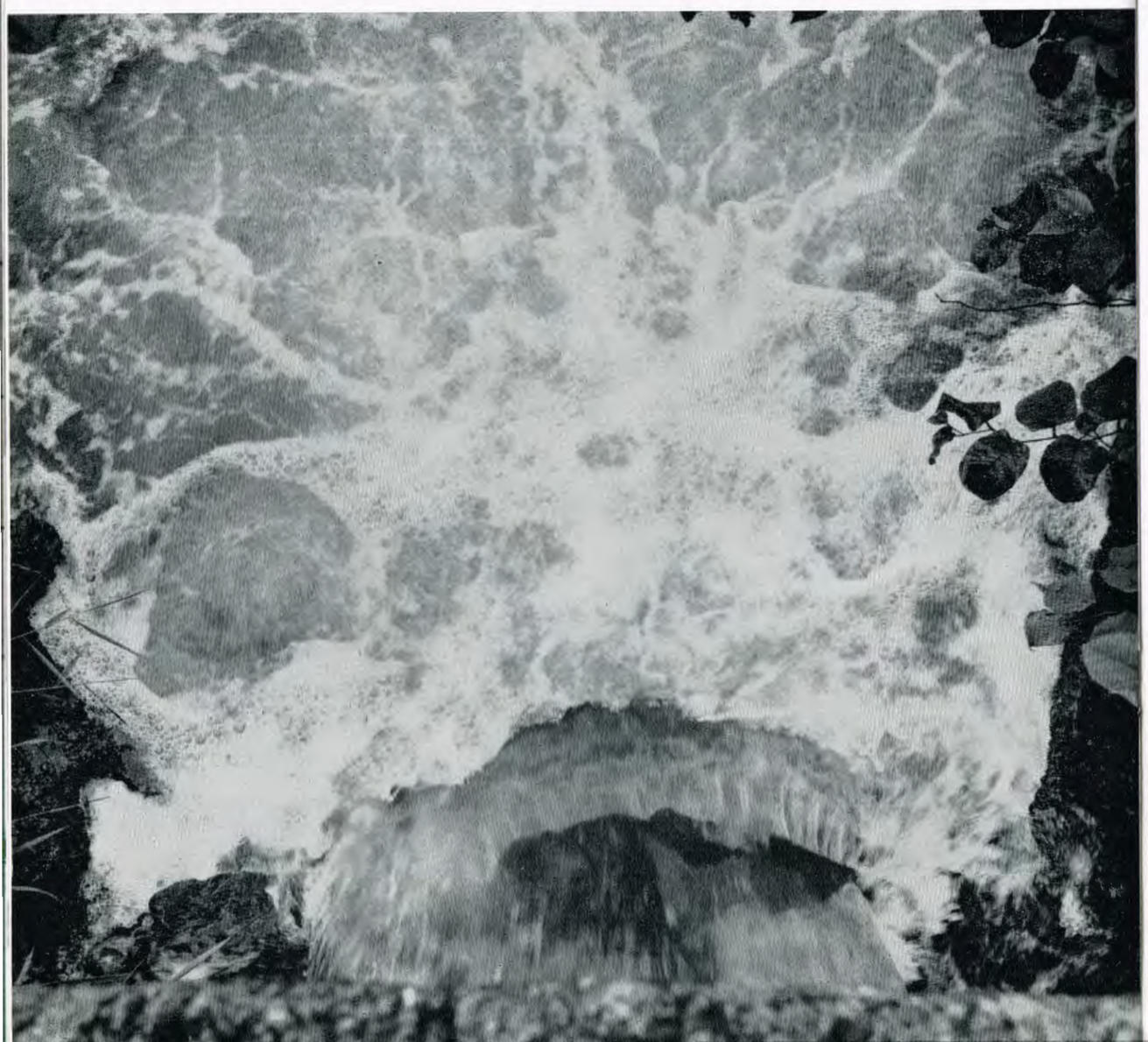
A couple of miles north-east of Huddersfield the River Colne flows through the Dalton Works of ICI's Dyestuffs Division. Every hour it provides up to 1m. gallons of water for cooling

Services Engineer Philip Goodall has looked after the services, including water supply, at the Huddersfield Works since 1960

Outside Serviceman George Richardson joined ICI in 1950 as a process labourer, has worked in the power house since 1951



Boiler Plant Chemist Peter Whiteley, who joined ICI in 1958, has been in this job since 1965. He regularly analyses water samples



deal. The laws on water conservation, anti-pollution measures – and their own individual rights as users – are carefully watched and interpreted: some of the relevant acts of Parliament which are invoked go back to 1790.

Conservation and anti-pollution. These are key words at Dalton Works, and every effort is made to ensure that no water is needlessly wasted or contaminated. Inspectors from the river authority can enter the works at any time to satisfy themselves that these efforts are adequate. Two other key words are drought and flood, and both conditions bring their own problems. In the case of drought – and it *can* happen, even in these waterlogged islands – certain measures can be brought into force, the most effective of which is to tap a number of boreholes discovered on Company-owned land following a geological survey some years ago. The level of the water in the river within the works perimeter can also be raised a foot by erecting a temporary dam at a point on the river where the water gushes over a weir.

Serious flooding, fortunately, does not happen very often. As they say on the works, they 'get a bad scare every two years and a bad flood every ten.' But even so, a constantly wary eye is kept on the river level and a flood precautions procedure is laid down. This involves setting up a special flood control centre when the level of the water in the Lees Head Beck reads 174·75 ft. above sea level on a special marker. The assistant works engineer, the flood control officer, an assistant works manager and the labour officer will be called in to help the services engineer man the control centre. Should the level of the water rise still further, men are appointed to take readings every 15 minutes at three other marker boards on the river, and this information is fed directly through to the controllers. If the position becomes even worse, members of senior staff are called in, and message centres are set up to transmit information from various areas of the works to the control centre so that a course of action can be decided upon. The action taken is governed to a certain extent by past experience: although flood water can be unpredictable in its behaviour, it is known that the probable rate of rise of water is something like 1·5 ft. per hour. The threshold levels of the various buildings in the works are already listed, so it is always known which of these are likely to become affected first.

But these are abnormal circumstances: in the main the river runs smoothly enough and at any one time there are usually only two men on the works who take much notice of it. The first is known as a service man (actually there are four of them, but they work shifts), and his job divides itself roughly into two-hour periods. During these periods he makes a set round of various parts of the works where he has specific jobs to do such as the opening and closing of certain valves, attending the pumps and compressors, oiling and greasing, switching on – or off – water pumps and air compressors and certain minor plant adjustments. But his job also includes 'looking after' the river, if it is possible to phrase it that way. It is he who checks the level of the water, for example, and every two hours between spring and autumn he takes its temperature. As already mentioned, if this rises above 20 degrees centigrade (and if there are six or more degrees difference between that and the wet bulb temperature on the humidity recorder) he must divert the water supply to the cooling towers.

The other man concerned is the boiler plant chemist. He analyses samples of the river water every other day on alternate shifts – he is mostly concerned in finding its pH value to determine whether the water is acid or alkaline. Other samples are tested at six-monthly intervals to discover the dissolved solids content of the water. There is a whole list of these, including sulphates, chloride, calcium and magnesium. The hardness of the water is also measured and, strangely, this varies enormously; but normally the water *is* comparatively hard so it is fortunate that softness is not essential.

Water for industry is a growing national problem quite distinct from that of satisfying the ever-increasing demands made by domestic consumers. In the years ahead much thinking about it and a great deal of hard work must be done if we are to continue our expansion as an industrial nation. But for some time to come Dalton Works' supply seems assured, and for that they can thank the river Colne.

Sir Archibald Glenn (Chairman, ICIANZ)

Photographs: Otto Karminski

Born in Australia at Sale, Victoria, in 1911, Sir Archibald Glenn comes from a family of Australian farming pioneers. He was educated at Scotch College, Melbourne, and the University of Melbourne, where he became a rowing Blue and took his engineering degree in 1933. He is a Member of the Institution of Engineers (Aust.) and a Member of the Institution of Chemical Engineers (London) and in 1957 he took the Advanced Management Course of Harvard University. In 1935 he came to ICIANZ as works engineer at the Nobel Explosives Factory, Deer Park. From 1939 onwards until 1944 he was primarily responsible for the design and construction of a group of wartime explosives and chemical factories for the Government of Australia. Two years in North America and in Britain with ICI followed, after which he became chief engineer, ICIANZ, in 1946 and controller, Nobel Group, in 1948. Appointed technical general manager, ICIANZ, in 1950 and a managing director since 1953, he became Chairman and Managing Director in 1966. He was knighted in the 1966 Birthday Honours List. He is a member of the Manufacturing Industries Advisory Council of the Department of Trade, of the Explosives and Chemicals Advisory Committee of the Department of Supply, and of the Council of Industrial Design of Australia. He is Chancellor of La Trobe University, Melbourne.

'Always remember what a vast country Australia is: when you look at Woomera on a map it seems like a suburb of Adelaide, but to go out there is like visiting the back of beyond. It is only when you fly over the land in a small aeroplane that you realise Australia is the same size as the United States.' Quiet-spoken, quiet-suited, Sir Archibald Glenn is a world apart from many people's idea of a typical Australian. Yet he is an Australian through and through, born on the land, with a deep awareness of the scale of the land and the challenges that scale presents.

In running ICIANZ, vast distances have to be covered. The main centres of consumption in the country are dispersed along a very long coastline (12,446 miles), and the market is sub-divided into widely-spaced areas. One salesman's territory in Queensland, for example, is 300 miles by 800! So Sir Archibald is used to thinking in thousands of miles where his opposite number in England thinks in hundreds. The great stretch of his market brings climate problems too – extremes of heat and cold, dryness and damp, from Invercargill in the south of New Zealand to Darwin, almost on the Equator.

These huge areas have to be controlled by relatively few executives, and these few have to be more versatile than they need be in Britain, 'In Australia we find this trait of being all-rounders very necessary. Even the farmers, when anything goes wrong with their tractors, use their own forges, their own welding kits and so on. With us, many a financial man, for example, has switched over to sales. There's an altogether less formal, more versatile approach to business. In the summer many work the whole time with their coats off.

'We try as much as we can to find our own answers to our own problems. This applies particularly to research. It's quite a recent thing for ICIANZ to indulge in research, and it goes back just the last 20 years. For example, a lot of research and pilot plant work had to be done in our own Research Department on the new process we are adopting for PVC manufacture. The capital expenditure concerned was considerable, but the result was quite a lead for the ICI group as a whole. The main problem overcome by this work was the oxychlorination of ethylene. The old process created very large quantities of hydrochloric acid which then had to be disposed of. The new process dispenses with this and at the same time enables us to use the basically cheaper raw material ethylene, compared with acetylene. We have also done work of world-wide significance on new routes to nylon manufacture. One of the instruments we developed in the course of our process control work has been licensed to the leading instrument manufacturers in the US, and the income from royalties pays for our share of the New York office.

'In production, too, different techniques reflect the variation in, for example, so basic a raw material as salt. Raw materials have subtle differences that are not apparent to the man in the street. The salt that we have to use for making chlorine is solar salt. It has traces of uranium and other impurities in it, while in Britain you get a purer product from underground. Since our salt is more expensive we have to use it more efficiently. In England, salt is so cheap that when you have passed it through the processes the residual brine can be scrapped. In Australia we would recycle that salt and remove the built-up impurities before using it again in a closed circuit.

'Chemicals are a key factor in the growth of the Australian economy, whether it be fertilizers for the farmer, products for the mining industry or products used in the building industry. Natural gas, oil, minerals and farming are the main growth areas. The demand per head for fairly sophisticated products such as plastics has been about two years behind Britain and about four years behind the United States. But in some products this is changing and we are moving into an intermediate position. Packaging, for instance, is developing very rapidly in Australia. We benefit from this through our polythene. The widespread do-it-yourself building by Australians, and rising ownership of cars in a country of immense distances, all have a bearing on demand too. Despite the strongly-entrenched position of wool, there is also a growing demand for nylon and for 'Terylene,' especially in mixtures of 'Terylene' and wool, 'Terylene' and cotton, and so on.

'Since the war, fertilizers have also been one of the big growing-points (we dropped them at one time, but have moved back into them). This is a tremendous growth area in the Australian market. Since the country has such a low rainfall, or rather such a high evaporation rate because of high temperatures, we have to squeeze the last bushel out of the soil, and the use of nitrogen helps quite a lot. I think the coming trend is to develop the coastal belts of Australia for agriculture more than the interior: the inland areas will be used more for grazing sheep and cattle, the coastal area for crop raising. Nitrogen fertilizer has been very valuable for bringing what was regarded as marginal land into use for farming. We have established main centres for fertilizer manufacture and distribution in each of the principal eastern states of Australia. It is also a potentially important export – foreign exchange is still very important to us, although we are emerging from being mainly a primary producing country. Australia no longer rides on the sheep's back to the extent it did even a decade ago.

'One of the big recent developments in Australia has been minerals. Vast quantities of bauxite have been discovered and another big discovery was iron ore in the North-west. The Japanese are very good customers for this. Oil and natural gas too have been important. There have been discoveries in many parts of Australia now – the biggest of all in Bass Strait, where oil and gas have been found close together. Nickel has been discovered for the first time – in Western Australia and Queensland. All these resources are being developed. At the moment iron ore from the new deposits is exported, but the next step will be to build more blast furnaces and export pig iron instead, a more profitable semi-finished product.'

Having seen a little of how his markets have grown, we asked Sir Archibald a more personal question – how had he himself grown as a businessman?

'No longer on the sheep's back'

'I think the wartime experience was probably the most vital part of my career. I had the good fortune to be in on a number of wartime projects which were extremely interesting and challenging. For example, we had to train people to make their own glass-lined equipment, and we searched the records to find those who had some experience in this work. Some of them were actually pulled out of the army to do it. In those days you could always get the manpower, you could usually get the money, so you could tackle things that you wouldn't otherwise have been able to do. But a lot of this meant retraining after the war to get back to purely economic activities. It's taken a long time to breed a new commercial race of people in the Company – including retraining myself.'

'Was your engineering training basic to your career?'

'I'm very out of date as an engineer now, but I think having worked in a speciality and having had to concentrate on that was a good basic discipline.

'Another experience I found extremely interesting was my course with the advanced management programme at Harvard Business School. Having grown up on the technical side, I looked forward to meeting a lot of other people who had been trained differently. In the sessions where you had to present your own views on a problem you studied your set cases and then went into a formal session. There each one of us spoke on his solution, his concept of the problem. The thing that I found most interesting was that there were at least ten other solutions different from one's own. This showed the quality of the people one was working with, it made you more objective, and it was also very humbling too. You might find the other man's mind was much more advanced in dealing with the given problem. It was a very intensive 13-week course: I barely needed reading glasses when I went there, but I certainly needed them when I came away!

'We try to find our own answers'

'Thinking in thousands of miles'

'One thing that struck me, particularly at the beginning of the course, was the antagonism of the US businessman towards government as such. There were a number of people from the State and other Government Departments present, but when it came to the discussion of economic principles the businessmen were opposed to the Government interfering in anything. This seemed to be a built-in American philosophy. But towards the end of the course they had some very skilful American professors there who drew them on to the point of no return. Then they were forced to admit the place of government, whereas we in Britain and British countries would have accepted this without too much pressure.'

The steady growth of ICIANZ has brought plenty of problems for Sir Archibald in finding and developing the right kind of people to carry it through. With the special emphasis on expansion over the last few years, the overriding need in Australia is for chemical engineers and marketing men.

'This term, chemical engineer, has only received proper recognition here in the last decade – the Americans recognised it a good deal earlier. These are people who work with unit processes and pilot plants. In the last few years they have been scarcer here than chemists, the people concerned with the operations themselves. One of the biggest projects just on stream is the new olefines plant, similar to the one at Wilton but of course not so big. Its output will be 70,000 tons a year, which is getting into the world class. Having taken this step to build this olefines plant, it carries with it all the user plant. With PVC, for example, as I mentioned earlier, we are changing to a new process, and we'll be the first in the ICI group to make PVC based on ethylene. ICI will move into this area very quickly, and they're looking forward with great interest to obtaining the benefit of our experience on this plant. Polythene production is also being extended.'

Sir Archibald is acutely aware of the need to keep younger executives on the move, to offer them opportunities and encourage them to go all out in the interests of their own future. 'I always enjoy the personnel problems that arise in a business. One of the things that I'm particularly interested in, in a large company like ours, is developing the younger people and the intermediate managers. In a big company a lot of people at these levels can soon get to the stage where they lose interest, and then they begin to lose heart. They don't see the opportunities for themselves, even though you may do so. The thing is to find various ways of stimulating their interest. A good way is by dividing operations up into small sections so that one youngish man can be put into absolute charge of some of them. His progress can then be seen to be related to his own efforts.

'This applies particularly to salesmen. What we do is to say to the salesman: Here is the product. Here are the facts about it. Now go out and test the market. Then it's for him to go out and "eat, sleep, breathe and drink" the product. He gets tremendous satisfaction out of this, knowing that if he does it well, something else will be coming along. We've done this in quite a few areas. We had a very young team put on to make and sell polythene film. In a very competitive field they maintained a major share of the Australian market, and have always kept it profitable. And their name with their customers ranks very highly. In a very keen competitive situation it is essential to hold the market while you're making the next step forward.

'We sell a lot of cattle dip in Queensland, and once one of our salesmen, to show his customer that the cattle dip was not toxic in any way, jumped into it himself! This shows the enthusiasm of some of our salesmen. Of course, we don't expect everybody to go that far, but it's nice to have people who are enthusiastic.'

Archibald Glenn's interest in people goes far beyond the job he holds. Passionately concerned about education in Australia, he has been the moving spirit behind the bold new La Trobe University project, now going rapidly forward. The first students started work in March. He was elected to be its first chancellor in December 1965, and La Trobe is expected to grow to 10,000 students within ten years.

'I've made rather a hobby of educational activities. I have been chairman of the Interim Council since it was set up two years ago. Our Universities Commission is very interested in La Trobe, the first scheme of its kind in the country. It is modelled to some extent on the old English university college system. Everyone, including staff, will belong to one of the ten colleges and there will be no central union. In this way we hope to give students a sense of belonging even though it will be a large university. We are trying to strike the right balance between the college concept and the central university concept. There will be for example a central playhouse and an open-air auditorium. Now the professors of the university may well want their own professors' club, in which case one will be built for them. There'll be a considerable amount of autonomy granted to the master of each college, but they'll all be members of the university. We want to avoid the situation in so many universities where the teachers practically never rub shoulders with the students. And we're trying to get away from the idea of education being a nine till five operation and to include everybody in the life of the place.

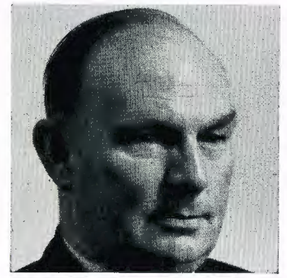
'We in ICIANZ are very proud of our membership of the ICI family. Everything possible must be done to preserve the spirit of co-operation and friendship that exists. It is in many ways similar to the Commonwealth itself, and likewise its members are growing up. ICIANZ, for instance, with annual sales now exceeding £100 million sterling, is quite a large public company with over 15,000 shareholders.

'We are also proud of being Australians. As the country's two-hundredth anniversary approaches we are conscious of what has been achieved, but we are more conscious of the tremendous task ahead in developing the latent wealth of this vast, rich land.'

people, projects, products

Mr. Kosygin in London

Mr. Alexei Kosygin, the Soviet Prime Minister, drew smiles from his listeners when he attended a luncheon given in his honour by Mr. A. J. Stephen Brown (second from right), President of the Confederation of British Industry, at the Hyde Park Hotel, London, on 7th February. Extreme right is Sir Paul Chambers, ICI Chairman.



New Division Chairman

Mr. J. C. Brown, a Deputy Chairman of Mond Division since its formation in 1964, succeeded Mr. D. H. Carter as Division Chairman on 1st April. Mr. Brown, who is 56, joined ICI in 1934 from Durham University, where he graduated in engineering.

ICI doubles 'Arcton' capacity

New plants at Runcorn have doubled Mond Division's capacity for 'Arcton' fluorocarbons and keep ICI the biggest producer of these products outside the USA. Since first introduced as a refrigerant in 1949, new markets for 'Arcton'-type products have opened up in aerosols and in polyurethane foams. **Left:** Storage silo for fluorspar, one of the raw materials for 'Arcton' manufacture.

ICIANZ Chairman installed as Chancellor

ICIANZ Chairman Sir Archibald Glenn invited three other University Chancellors to sign the visitors' book after he had been installed as the first Chancellor of Australia's new La Trobe University on 8th March. He is seen with (from left) Sir Robert Blackwood, Chancellor of Monash University, Victoria; Sir Robert Menzies, former Prime Minister and newly-elected Chancellor of Melbourne University, and Sir Charles McDonald, Chancellor of the University of Sydney. Sir Archibald was Chairman of the Interim Council of La Trobe, which began planning 2½ years ago for Victoria's third university (see page 60). The first intake of 450 students started at the university in March.

ICI Board retirements

Sir Paul Chambers writes:

In the retirement of Lord Glenconner, Sir Ronald Holroyd and Mr. Leslie Williams at the end of March the ICI Board lost three of the best Directors it ever had.

The retirement of the two most senior Deputy Chairmen is a special loss to me as Chairman, and I realise how heavily I have leaned on them for advice and support. Both are men of strong character, strong views and absolute integrity. There are no yes-men on the ICI Board – that is certainly how it should be – and the Deputy Chairmen are no exception. It is inevitable, therefore, that on important issues there should be differences of opinion. Both Sir Ronald Holroyd and Leslie Williams know how to put their views clearly, succinctly, and with great power of persuasion. In the end, if differences of opinion remained, as they must do sometimes, either of these colleagues of mine would agree to the adoption of a course not of his choice, and do it graciously and without rancour. Once, some years ago, Leslie Williams was in a minority – of one, I think – about a senior appointment; years later it became abundantly clear that he was right all the time and everybody else was wrong; there was no recrimination.

Lord Glenconner

Sir Ronald Holroyd

Mr. Leslie Williams

Sir Ronald has a quiet way of steadily digging into the facts of a large complicated issue and, almost remorselessly, coming steadily and finally to the right conclusion. The great petrochemical developments on Tees-side owe a tremendous amount to Ronald Holroyd's inspiration, energy and guidance, both before and after he joined the ICI Board.

Joining the ICI Board after being Chairman of the Paints Division, Leslie Williams brought with him a drive and a new sense of urgency in marketing. He showed that professionalism in marketing was as important as in research, in engineering, or in any other aspect of the Company's work. Under his leadership the Paints Division had demonstrated that with good management a Division could make a good return on capital year after year in a fiercely competitive market. It is to men like Ronald Holroyd and Leslie Williams that other Directors have looked for advice and support.

Lord Glenconner, who has served as a lay Director for 24 years – longer than any of his present colleagues – has been just about the ideal lay or non-executive Director. Detailed knowledge of the Company's manufacturing, merchandising, research or other activities is not sought in a lay Director; what is wanted is an objective, clear view on any important, broad issue which may arise. This we have come to expect, and get, from Lord Glenconner. He has always been most conscientious in his study of important Board issues and ready to draw attention if he felt that as a Board we were moving in a wrong direction. His quiet, courteous, almost diffident manner might to the uninitiated conceal the depth of his thought and convictions. As the senior lay Director there have been many occasions on which it has been necessary or desirable for me to consult him on some issue, and his advice has always been given freely and wisely.

All their colleagues on the Board will miss Christopher Glenconner, Ronald Holroyd and Leslie Williams from the Board table, but, perhaps selfishly, I feel that the greatest loss is mine.

Division Chairmen retire

Mr. S. Howard

joined the Blackley Works of Levinstein Ltd. early in 1922, and with his retirement on 31st March he broke the longest of the four remaining links between the Company's senior management and the companies from which ICI was originally formed.

When Sam Howard started his industrial career in the Levinstein Dyehouse, the British dyestuffs industry as we know it today had hardly come into existence. Although during World War I it was essential to manufacture many hitherto imported dyestuffs, the small industry, newly created for this purpose, had not by 1922 been exposed to the full force of competition from the formidable and long-established overseas manufacturers, in particular the Germans. However, there was no lack of enthusiasm for the task.

It was in this atmosphere that he was first introduced to industry, but, as one would expect, he rose to the occasion and qualified as an associate of the Manchester College of Technology before transferring to the Sales Department in 1934. He was appointed Sales Manager in 1943, Sales Director in 1951 and Joint Managing Director in 1956.

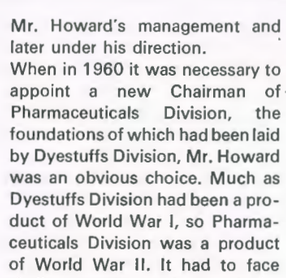
While Dyestuffs Division is now firmly established in a leading position in the world's dyestuffs industry, it is not surprising, starting from such a small beginning, that it took a long time to achieve. One of the most important factors which led to this ultimate success was the commercial organisation which was developed first under Mr. Howard's management and later under his direction.

When in 1960 it was necessary to appoint a new Chairman of Pharmaceuticals Division, the foundations of which had been laid by Dyestuffs Division, Mr. Howard was an obvious choice. Much as Dyestuffs Division had been a product of World War I, so Pharmaceuticals Division was a product of World War II. It had to face similar problems, in particular powerful and long-established international competition.

Under Mr. Howard's chairmanship the Pharmaceuticals Division was able first to consolidate its position and, in more recent years, to grow and become the highly successful business it now is. During the same period the Division's manufacturing assets have been completely replaced in the new works at Macclesfield, and it now has the most up-to-date plant of its kind in the world, so that Mr. Howard leaves a Division which is well equipped in every sense to make further progress.

In spite of the effort that Sam has put into his work he has found time for a variety of other interests, not least of which has been his family.

Mr. Howard



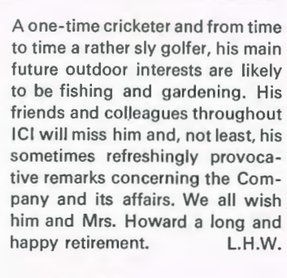
A one-time cricketer and from time to time a rather sly golfer, his main future outdoor interests are likely to be fishing and gardening. His friends and colleagues throughout ICI will miss him and, not least, his sometimes refreshingly provocative remarks concerning the Company and its affairs. We all wish him and Mrs. Howard a long and happy retirement. L.H.W.

Mr. D. H. Carter

retired on 31st March after nearly thirty-nine years' service with the Company. After leaving Cambridge with an honours degree in mechanical sciences, he spent some time in Canada building bridges and skyscrapers. He joined ICI in 1928 and went to Billingham as a research and process engineer. In 1931 he transferred to Steatite and Porcelain Products Ltd. (then an ICI subsidiary) as Works Engineer, but two years later displayed the versatility that his friends now know so well by returning to Billingham as a member of the Sales Control Department. In 1938 he moved south to serve in the Company's South Eastern Sales Division in London.

At the outbreak of war he reverted to engineering. He served throughout the war, during which he became Lieutenant-Colonel in charge of the Tank Armament Development Group.

Mr. Carter



The end of the war saw him back in ICI, this time in the Plastics Sales Department in Southern Region. Two years later he was in Cheshire, and he became Commercial Director of the General Chemicals Division in 1951. He became Joint Managing Director of the Division in 1953 and Chairman in 1961. In 1963 he added the chairmanship of the Alkali Division to his responsibilities.

When Mond Division came into being in January 1964 Derrick became its first chairman. In this position he was responsible for the largest Division in the Company, and all his talents and energies were absorbed in welding the constituent parts into a whole. At the same time the Division was undertaking a large capital investment programme to extend capacity, to diversify, and to modernise existing processes. The progress made by Mond Division in its short life is itself a testimonial to Derrick Carter's leadership.

Derrick has a formidable range of interests – shooting, sailing (though he has not had much time for it latterly), gardening (sometimes under compulsion), collecting paintings, and doing things in his workshop.

He has decided to find a home somewhere in the South of England. One thing is certain – he will always have plenty of things to interest him. We shall miss him, and all his friends inside and outside the Company will wish him, and Mrs. Carter, a long and happy retirement. J.E.S.

ICI Malaysian factory opened

The Prime Minister of Malaysia, Tunku Abdul Rahman (left), officially opened the fertilizer and chlorine plants of the Chemical Company of Malaysia Ltd., an ICI associated company, on 28th January. With him here are Sir Paul Chambers, ICI Chairman and Mr. H. G. Owen, Chairman of the ICI Group in Malaysia and Singapore. A thousand guests attended the ceremony on the 70-acre site at Padang Jawa near Kuala Lumpur. To mark the occasion CCM is offering ten agricultural scholarships, to be known as Tunku Abdul Rahman Scholarships, to the University of Malaya.

the chain-makers

John Wren-Lewis

At present more industrial chemists are working on 'high polymers' – the substances which go to make plastics, synthetic rubbers and fibres and most modern paints and varnishes – than on any other subject. Certainly polymers and the chemicals that go to make them are ICI's most important group of products, and they take up a large part of its research effort in most Divisions and in the Petrochemical and Polymer Laboratory. Annual world production of such materials is many millions of tons.

When ICI was first formed forty years ago materials of this type were mere curiosities for the general public. Most of the important ones had not yet been invented, and, what is more, scientists had only just begun to understand how they could be made. Nevertheless, within its first few years ICI research gave the world 'Perspex,' which overcame the public image of plastics as 'cheap and nasty substitutes,' and polythene, today one of the most important of all plastics.

In this ICI scientists here showed great acumen in quickly taking up new ideas which came mostly from North America, where several young scientists were following up the lead given by Hermann Staudinger in Germany. He had shown that the secret of structural 'stuff,' whether natural like rubber, cotton, wool or gum, or artificial like celluloid, rayon or the Bakelite-type resins, was simply that they were composed of basic particles (molecules) many thousands of times bigger than the molecules of ordinary chemicals like salt or soda, or even of very complicated chemicals like dyestuffs.

One of these pioneers was William Chalmers of McGill University, Montreal. Another was Roy Kienle of the General Electric Company in the USA. A third, perhaps the greatest of them all, was Wallace H. Carothers, who in 1928 went from Harvard University to head the newly-established fundamental research laboratory of the Du Pont company.

Carothers and Kienle between them were instrumental in formulating the essential principle by which structural substances can be synthesised – the principle of starting with ordinary chemicals whose molecules can react with one another in at least two ways at once: they called it the principle of *multifunctionality*. If the starting material, the 'monomer,' is *bi*functional, each molecule has as it were two hands, and suitable chemical activation makes them join hands in long chains. This gives materials which for practical purposes are something like very light, cheap metals, in that they can be 'plasticised' by melting or by softening with some chemical plasticiser, moulded (or spun into fibres), and allowed to set, but can be softened or melted again if need be. These are called *thermoplastics*.

If, on the other hand, the monomer is *tri*functional, the units in the chains still have active links with which the chains can join on to each other, and in this case 'setting' (or vulcanisation in rubber) is a chemical process which cannot be reversed. (The process is technically known as 'cross-linking.') These polymers are therefore somewhat like the clays used in pottery, and they are called *thermosetting resins*.

Staudinger had already recognised the functionality principle in materials like styrene, in each of whose molecules there are two carbon atoms joined by a double valency link instead of the normal single one. He recognised that such a double link produces a strained situation in which, given some suitable energising process, the molecules will spring open and join on to each other in chains. Carothers called this the 'A' or 'addition' method of polymerisation, and Chalmers showed that it involved a most unusual form of chemical reaction, far more rapid than most because each molecule automatically activates the next in the very process of joining on to it. (We now know, with accurate methods of measuring reaction rates, that thousands of molecules can join together in a second.) Chalmers also suggested applying this polymerisation technique to more complicated double-bonded compounds known as methacrylates, a line of thought which lay behind the ICI development of 'Perspex.' Later, the ICI invention of polythene showed that the principle could be applied to the simplest of all double-bonded compounds, ethylene.

Meanwhile, Kienle's work had shown that the same kind of thing could happen with the rather different sort of reaction that occurs between alcohols and carbon-based acids, where two molecules react to exchange hydrogen atoms and form water plus a compound known as an *ester*, a reaction which

'Nufil' polypropylene fibre is made by utilising directly the chain-like character of polymer molecules. Polypropylene tape can be made with the molecules 'oriented' along its length, so that it will tear easily lengthwise but has great strength across. Split lengths are plaited into a cheap but strong fibre

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chemists call *condensation*. Kienle worked with acids and alcohols with more than one active group each, and made chain compounds which he called *poly*esters or 'alkyd' resins ('alkyd' being an abbreviation of 'alcohol' and 'acid'), the materials which have since revolutionised the paint industry. Carothers called this the 'C' or 'condensation' method.

Carothers himself tried to use the condensation method to produce a material suitable for spinning into fibres, and when he had little success with polyesters (which came much later when Whinfield invented and ICI developed 'Terylene'), he turned to another type of condensation reaction, the kind known as *amide formation*.

The term 'amino' is used in chemistry to describe compounds made by substituting a carbon-based group of elements for one of the hydrogen atoms in ammonia, NH_3 (hence methylamine, $CH_3.NH_2$, and ethylamine, $C_2H_5.NH_2$). Very complicated organic groups can be used in this way, and if the group happens to be derived from an acid the resulting compound is given the special name of *amide*: thus acetic acid, $CH_3.CO.OH$, gives acetamide, $CH_5.CO.NH_2$. Carothers recognised that if an amide with more than one active (NH_2) group were to be reacted with an acid with more than one active (COOH) group it should be possible to persuade chains to form, which he called *polyamide* chains.

He tried reacting a bifunctional amine with six carbon atoms per molecule, hexamethylene diamine, with a bifunctional acid also containing six carbons per molecule, adipic acid, and so made the material known nowadays as Nylon 66. This substance is sometimes called 'nylon' pure and simple, but the proper modern usage makes this a generic term for all polyamides of this type, specific nylons being given suffixes like 66 to denote the number of carbon atoms in their components. Another common nylon nowadays is Nylon 6, made from an *amino acid*, a compound with an amino group at one end and an acid group at the other end of a single six-carbon molecule.

Tragically, Carothers died in 1937 before his invention had shown its commercial possibilities. The Du Pont company were still involved in the enormous amount of work which had to be done to develop processes for making hexamethylene diamine and adipic acid, as well as on spinning nylon into threads on the mass-production scale, before they could launch their product. They are often quoted as saying that it required four years, 230 chemists and engineers and $27 million to take the material from invention to its first commercial manufacture in 1938. These figures give some idea of what industrialists mean when they say that basic invention is only a small part (even if the crucial one) of introducing new products for human use. One of the most important frontiers of change in industry today is the research, which may seem dull to the outsider, that goes on all the time to cheapen the manufacture of polymers and of their components.

Carothers did, however, have the satisfaction of knowing that he had synthesised a structural material involving amide groups in something like the same way as do the proteins of living matter. In those days there were still many who believed that structural substances like protein were so complex that they would always elude scientists. Carothers had dedicated himself to 'synthesising giant molecules of known structure by strictly rational methods,' and he saw that although nylon is infinitely simpler than protein, it does provide a 'model' of its living counterparts in wool and flesh. Today, biochemists have built on Carothers' theories about high polymers to achieve an understanding of the proteins, and the polymer technology of tomorrow may well begin to rival the subtlety and variety of life itself.

When Carothers invented nylon he saw it as a 'model' of the much more subtle protein materials which living creatures make. Now synthetic fibre composites can be made which rival leather's own structural advantages. The picture shows shoe uppers which have been made from ICI's newly introduced 'Ortix'

Antarctic venture

Christopher Davies

From 1963 to 1965 Christopher Davies, now a technical officer in the Research Department of ICI Fibres Ltd. at Harrogate, worked as a geophysicist with the British Antarctic Survey. Here he describes in words and pictures what it was like to carry out a research programme at 65° South.

'Wanted – physicists for service with the British Antarctic Survey.' A small advertisement in a Sunday paper. Ordinary, except for that word 'Antarctic.' To most of us, the word conjures up visions of blizzards, huskies and tough, bearded men. As a newly-graduated scientist, it seemed to me that here was a splendid opportunity to use my training for that 'something adventurous' which we all imagine ourselves doing sometime in our lives. So I replied to the advertisement and eventually signed on. For the next two years I was to be a geophysicist at the Argentine Islands Base, which lies 80 miles north of the Antarctic Circle and 600 miles due south of Cape Horn.

After six months training, a short leave and a six weeks' voyage, our party of new men arrived in January 1963 at the Islands, a small group about four miles off the west coast of the Antarctic Peninsula. The main island has a 200 foot ice-cap with ice-cliffs to the south and an extended low-lying area to the north, on which lies the base. This is built on rock exposed in summer and consists of a long, low living hut with ancillary buildings such as the generator shed close by. Not very large, but with a truly magnificent view. The mountains of the Peninsula rise 3000 feet and more out of the sea, with their ice-capped peaks and steep rocky cliffs tumbling away into the distant south. Glaciers squeeze their way between the mountains into the sea, slowly adding to the multi-shaped icebergs perpetually floating in the distance. Added to this black and white panorama is the intense colouring of dawn and dusk when the sun lies low in the sky.

But there was little time to appreciate the view that first day. With the arrival of the ship, the first for nine months, the annual task began of unloading the supplies and equipment needed to keep fifteen men alive and working for the next twelve months. It had to be done quickly before a chance wind could blow ice-floes into the anchorage and prevent the ship's boat getting to shore. For three days we carried hundreds of boxes up from the jetty to the hut. Food, instruments, charts and a thousand other things were humped up to the hut, plus the final agony – 400 bags of coal. But at last it was over, the ship left to relieve other bases, and we newcomers had time to meet our companions and learn our jobs.

Our base was a geophysical observatory, our work part of the intense scientific study being made by several nations in the Antarctic. The British run six bases and are concerned with the area round the

Antarctic Peninsula. Botany, zoology, meteorology, geology and geophysics are a few of the many subjects studied, either out in the field as survey work or on static bases like our own. All this work adds to our knowledge of one of the last unexplored regions of the earth. It is a unique area, half as large again as Europe, covered by an immensely thick ice-cap, which exerts a profound influence on the rest of the southern hemisphere.

At our minute spot on this continent the day began at 7.30. We were awakened by the early-morning weather man, who rose at 6.00 to do his three-hourly observation. Getting up varied in unpleasantness with the outside temperature, since the bunkrooms were unheated owing to shortage of electrical power. After breakfast, four met. men hurried to launch the daily hydrogen balloon which carried a radiosonde, a small transmitter which measures temperature, pressure and humidity, up to about 8 miles above the earth. On windy days and in the darkness of winter this was no mean task, and often the sonde would be damaged and a second balloon would have to be launched.

The rest of us, physicists, ionosphericists, cook, diesel man and radio operator, busied ourselves with our own work; observations on the sun, changing of charts on continuous recorders, maintenance of instruments, radioing of results to the outside world, taking the three-hourly meteorological observations, and so on. In my own work, shared with one other, we ran continuous recorders to measure the earth's magnetic field, seismic disturbances, radiation from the sun and sky, and tidal variations. Some instruments, like those measuring the earth's magnetic field, were housed well away from base disturbances, but still had to be visited whatever the weather. Many times we cleared hoar-frost off the glass-domed radiation instruments; and every three hours someone would flit out to take the met. observations.

There were too the basic chores of living, which we divided into four categories, and did in weekly turns. Assistant Cook was lowest in popularity, not so much on the five days of washing up and helping our professional, but on his two days off. Then the Assistant apprehensively took over. They were days of an agony of worry with some spectacular successes and many conspicuous failures. Notable dishes: red and blue coloured pie-pastry on Election Day, and fallen eclairs looking like Scotch pancakes, but successfully passed off by a liberal covering of multi-coloured mock cream. The cooking was certainly colourful! A Galley Slave helped with the washing-up and a Gash Man swept, stoked and emptied waste-buckets. Finally the Water Man cut blocks of snow, carried them indoors and tipped them into the hot and cold water tanks. So exhausting was this task that water had to be carefully rationed. Completely surrounded as we were by a vast ocean of frozen water, this seemed most ironical.

Superimposed on the daily work pattern were the seasonal tasks. With only three hours of daylight, winter kept us indoors; decorating, overhauling dinghies for the summer, rewiring electrical circuits and stripping down instruments. But in the twenty-four hours light of summer, with low snow levels and high temperatures, we re-covered roofs, mended broken aerials and erected new buildings such as the tide-gauge built in my first summer at the base.

So there was much routine in our life because of our situation and the nature of our work. But there were compensations in the fun of our small community, the challenge of repairing equipment with only limited resources, and above all our unusual surroundings. These were at their best in the 'spring' (November). At this time the winter sea-ice still remained crisp and hard, yet the days were long enough for extended trips; and the birds and seals returned after the winter migration and in a teeming, squawking cacophony of sound produced and nurtured their young around our islands.

We skied up and down the islands examining the cliffs and ice caves. We visited the penguin rookery and endured for our curiosity highly-intelligent massed attacks. We were chased by large mother seals as we tried to photograph their very photogenic pups, and we were dive-bombed by angry skuas as we examined their nests. We also took our 'holidays,' dog-sledging across the sea-ice to the mainland, camping and climbing mountains. And we skied on our own island's steep slope as often as we could.

It was not all clear blue skies and hard surfaces, however. The Antarctic is a place of rapid change. On two occasions we experienced a rise in temperature from −20°F to freezing-point in twelve hours, accompanied by tremendous creaks and groans from the hut. A clear, still day was tremendously hot even at temperatures of only 10°F, with the sun beating down from above and reflected up off the white snow; but in an hour it could become clouded over and a blizzard lasting several days might begin. Body coldness was rather the result of

Antarctic venture

inadequate dress than because the cold could not be guarded against; fingered gloves were colder than mitts, leather boots colder than canvas mukluks with duffel inners.

Cooped up together as we were, good personal relations were essential. Ill-feeling had to be suppressed and, probably more important, faction-forming avoided. It was very hard at times. I remember being driven nearly crazy for some weeks by a companion who continually slammed doors, but after containing myself for some weeks the feeling suddenly disappeared and thereafter the incident aroused only an objective curiosity in me. The strains of living were lightened, however, by the humour and slang of base life, and by our monthly birthday parties (dates of birth were arbitrarily altered so that we had one party per month). These parties, and the really big celebration of the year at mid-winter, consisted of an extra-special meal with everyone dressed in suits. This unusual form of dress, coupled with freshly-shaved faces, often gave the feeling that one was meeting a bunch of complete strangers. Private supplies of beer and other carefully-hoarded 'luxuries' helped these occasions, and we passed the time with darts matches, cards, sometimes a sing-song, and ludo. From winter to spring to summer, the months passed rapidly, and in early December the sea-ice began to break up and the huts emerged from the snow. Soon it was time for the first ship, and we awaited it in a nervous state known as 'pre-ship tension' – a compound of 'How much mail will I get?', 'What will the new blokes be like?', 'How many sacks of coal to unload this time?', and a longing for fresh meat and vegetables. Finally it came, but after just enough time to open our best-looking parcels, the unloading of supplies began. The annual cycle had begun again – more ship's visits, new faces around the base, summer building, and soon, the last ship and winter. The second year was much like the first, though with different places visited and different people to get angry with (and to anger). But when the ship arrived the next summer, I had a last experience of unloading, a last ski on the island, and regretfully boarded the ship to return to England.

In retrospect it was an enjoyable trip, sometimes exciting, sometimes tough, but always interesting. I have never regretted going or the time spent there, and occasionally wish I could return; but at these times I also remember that when I finally stepped ashore in England I was very glad to be home.

ICI magazine

Europort at dusk, seen from the 'Dutch Mate,' one of a fleet of special Dutch tankers used by Mond Division to export bulk chemicals.
Photograph: Charles Scott (Mond Division)